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MAGAZINE

JUNE 30, 1992

THE INDEPENDENT GUIDE TO PERSONAL COMPUTING

VOLUME 11 NUMBER 12

NETWORKING

Taking Inventory of Your LAN: Five Packages Tell You What's Connected

COMMUNICATIONS

We Review 26 New Communications Packages: Breakdown Or Breakthrough?

FIRST LOOKS



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Inside

Okay, so The Year of the LAN took a *little* longer getting here than we all expected. When industry pundits first declared its fruition back in 1982, the cost of an Ethernet connection ran \$5,000 per computer—about the same as an entire PC. Now, a decade later, the prediction has finally come to pass. An additional 30,000 PCs are attached to LANs each day, LAN penetration among business users approaches 50 percent, and Ethernet cards cost less than \$200.

With the spread of networks comes beefed-up coverage of networking and communications by *PC Magazine*. Leading our expanded coverage is the new associate editor for networking, David Greenfield, who joins our team after



David Greenfield, new associate editor for networking and communications: coverage tailored for network administrators and end users.

two years of writing about LANs and internetworking for *Data Communications* magazine. He'll work with project leader Rich Brady and senior networking editor Frank J. Derfler, Jr.

"It really is true that the network is the computer," says Greenfield, referring to the old advertising slogan of workstation-maker Sun Microsystems. With networks becoming more sophisticated, the testing facilities for analyzing network hardware and software must become increasingly sophisticated, too. "*PC Magazine* is the only publication with the facilities and the resources to consistently provide large-

scale, in-depth network testing," says Greenfield. PC Magazine Labs in New York City has a 32-node testing network; our corporate facility, ZD Labs in Foster City, California, has a test-bed spanning 250 PCs, an IBM 9375 mainframe, and a Digital Equipment Corp. 4500 minicomputer.

Within the corporate world two sets of users have emerged: small workgroups of 5 to 30 PC users who administer the network themselves, and larger

networks spanning 50 or more users often spread among many workgroups, which demand a full-time network manager. Greenfield's goal is to address the needs of both.

"We're long past the time when purchases could be made with a blind eye toward the administrator or

the end user," says Greenfield. "Today, both sides need to be considered."

In this issue, he's had a hand in three of the four feature reviews, which address the needs of the corporate manager and the end user. He wrote the introduction to our review of 6 super servers and managed the reviews of 26 communications software programs and 5 LAN inventory programs.

And with networking becoming the key ingredient in connectivity, we've changed the title of Greenfield's section from Connectivity to Networking and Communications to match this trend.—Bill Howard

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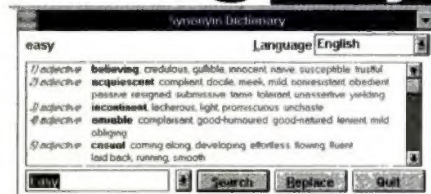
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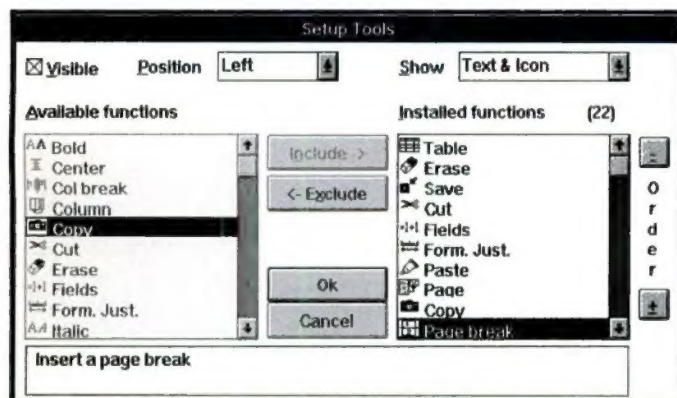
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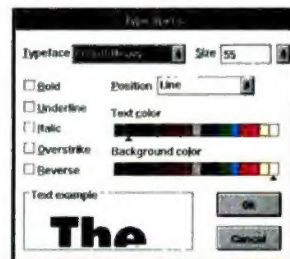
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17-Inch Displays: A Better View of Windows
Oliver Rist / If you want to get the most out of Windows, you want a 17-inch monitor. For only a little more than \$1,000 street price, a 17-inch display enhances productivity by allowing you to have more Windows applications on-screen at the same time. The 16 monitors we review here also provide high-quality images, a wide selection of image controls, and ergonomic extras such as antiglare screens.

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David Greenfield / Today's file servers boast superior scalability for large networks. Multiprocessors, disk arrays, fault tolerance, and speed are all part of the equation. PC Magazine Labs tested six full multiprocessing servers at the helm of a 96-node network.

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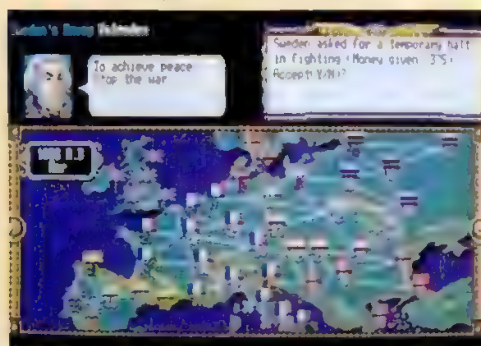
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PC Magazine
Feb. 11, 1992

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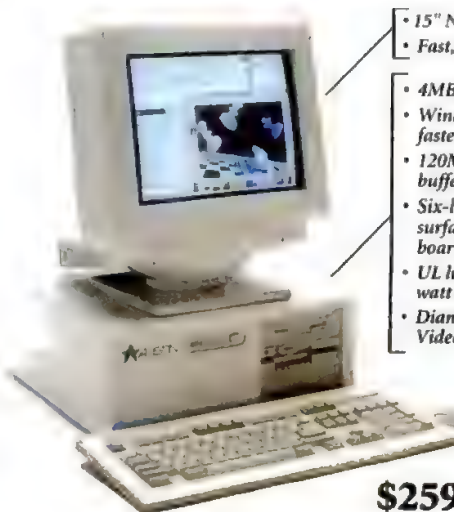
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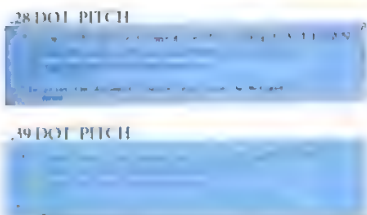
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386/SX16 U.S. 1990
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386/SX20 U.K. 1991
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1.44MB & 1.2MB Floppy Drives	1.44MB & 1.2MB Floppy Drives	1.44MB & 1.2MB Floppy Drives	1.44MB & 1.2MB Floppy Drives	1.44MB & 1.2MB Floppy Drives
101-Key Keyboard	101-Key Keyboard	101-Key Keyboard	101-Key Keyboard	101-Key Keyboard
DO5 5.0/Windows 3.1 Mouse	DO5 5.0/Windows 3.1 Mouse	DO5 5.0/Windows 3.1 Mouse	DO5 5.0/Windows 3.1 Mouse	DO5 5.0/Windows 3.1 Mouse
Small Footprint Chassis	Small Footprint Chassis	Small Footprint Chassis	Small Footprint Chassis	Small Footprint Chassis
\$1390	\$1590	\$1790	\$1990	\$2290
486/33 EISA WinTower	486/DX2-50 WinStation	486/50 EISA WinStation	486/50 EISA WinTower	386/SX25 Notebook
Intel 486 running at 33MHz/ w/64K Cache (to 256K)	Intel 486DX2 running at 50MHz/ w/64K Cache (to 256K)	Intel 486 running at 50MHz/ w/256K Cache	Intel 486 running at 50MHz/ w/256K Cache	386SX running at 25MHz/ w/64K Cache (to 256K)
8MB RAM (to 64MB)	8MB RAM (to 32MB)	8MB RAM (to 32MB)	8MB RAM (to 64MB)	1MB RAM (to 32MB)
120MB Hard Drive	210MB Hard Drive	210MB Hard Drive	210MB Hard Drive	60MB Hard Drive
FTL Monochrome Monitor	14" VGA 1024x768 Non- Interlaced Color Monitor w/1MB Video RAM	14" VGA 1024x768 Non- Interlaced Color Monitor w/1MB Video RAM	FTL Monochrome Monitor	10" VGA LCD Display 640x480 w/32 gray scale
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101-Key Keyboard	101-Key Keyboard	101-Key Keyboard	101-Key Keyboard	80-Key Keyboard
DO5 5.0/Windows 3.1 Mouse	DO5 5.0/Windows 3.1/ Mouse	DO5 5.0/Windows 3.1 Mouse	DO5 5.0/Windows 3.1 Mouse	Optional DO5 5.0 Windows 3.1
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Letters

DEVELOPERS MUST PROGRAM!

■ About "Nine Multiuser Databases: Robust and Ready to Share" (March 31, 1992). Is there something wrong with *DataFlex* being a developer's tool? It's marketed as such and does not apologize for the sophisticated thinking required in program development. Are average users expected to program in C++ or use the resulting programs?

DataFlex provides an object-oriented fourth-generation language with an embedded DBMS. You seem to think OOP is a negative feature.

David Loewen

Edmonton, Alberta, Canada

One sentence says it all. "The biggest benefit of *DataEase* is that you aren't required to write any code." There speaks a truly naive nonprogrammer. I'm sorry, but if you're going to write *real* applications with *real* project requirements, then you *cannot* champion this as a benefit. Yes, I was naive once, but ten years' experience has taught me that you can't do it all with no-brain approaches. You have to get your hands dirty, and yes, learn a language. If you don't know that, you shouldn't be writing reviews at this level. A company I advise from time to time has had to totally abandon *DataEase* because of its poor performance and lack of power. It brickwalls the programmer at any real-life level of complexity.

Chris Hibbert

Ealing, England

I manage my audiology practice with a software system called *Charms*, developed by Rx Software, Upper Darby, Pennsylvania. The system is a multiuser version based on *DataFlex*. Certainly there are specific reports provided for looking at various aspects of daily and monthly activity. And there are occasions when I have requested additional programming in order to access data unique to my practice. However, I think the comments in your article completely and un-



Should multiuser databases totally free you from programming?

fairly ignore the built-in and very powerful point-and-shoot Query feature. With Query I can output an almost unlimited view of patient and financial activity.

Robert H.W. Saltsman

Ellicott City, Maryland

Advanced Revelation performed very poorly in your report test. This seems to have been caused by your trying to make *AREV* work like other databases. You say that the report "involves joining two huge tables, and neither of these packages [*AREV* or *DataEase*] moves large amounts of data with ease." There was no need to move any data whatsoever. *AREV*'s active data dictionary lets you create logical joins between any number of files in a system. By creating symbolic dictionary definitions, you can extract the desired data directly from the joined file at report time. No competent *AREV* programmer would ever physically join multiple files into one to create a report.

I find it significant that *Infoworld* concluded that performing database tests with people who had limited experience with the products was unfair, considering

the complexity of all DBMSs. They let the vendors create the testing programs themselves, following the same guidelines. *AREV* fared far better than it has in any review before or since.

Charles F. Alexander

Clifton, New Jersey



PC We agree that vendors should
MAGAZINE create the testing programs them-
selves. That's how the testing
was conducted for multiuser databases.
Not only did the vendors write the code,
they were on-site during testing.—Ed.



IS WINDOWS 3.1

DR DOS FRIENDLY?

I've got a friend who is telling me that Microsoft deliberately coded Windows 3.1 not to run on DR DOS 6.0 systems. I've got DR DOS 6.0 and Windows 3.0 running on my machine, and up to now I've seriously considered upgrading to Windows 3.1. But if Microsoft is going to make me downgrade to MS-DOS 5.0 to upgrade to Win 3.1, forget it! At this rate, I'll be running OS/2 2.0 by year's end.

Jeff Shultz

Augsburg, Germany



PORTABLES MUST HAVE FLOPPIES!

Three comments on Michael J. Miller's "Don't Forget the Floppy Drive" column (March 31, 1992):

First of all, leaving backups until the end of the day is living dangerously. Every important file should be copied to a floppy when work on it stops—before the session is ended or a new project is begun. During lengthy jobs, floppy backup should be done at reasonable intervals.

Second, virtually every portable PC user will operate now and then in places where there is no network connection or desktop with a file-transfer utility. Airports, jet cabins, and hotel rooms are obvious examples.

Third, this "ultralightness" mania is nuts. Anyone who can't handle an extra

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CIRCLE 231 ON READER SERVICE CARD

Letters

half-pound needs prompt physical or psychiatric therapy. Using a portable PC without a floppy drive is nuttier still. Waiting until the end of the day to back up is even worse.

Jordan V. Hodgson
Torrance, California

XEROX HAS WHAT WE WANT?

Just a brief note regarding Bill Machrone's March 31, 1992, column ("Time for a New Interface"): Some of the features that he would like to see in a new GUI have been in use for the past three years at our office on our Xerox 6085 Documenter System.

Xerox had some very good ideas with this system. The problems came when Xerox incorporated these ideas into a proprietary hardware/software system and didn't provide enough extras. The fonts are limited and bitmapped, and there have been no software updates to keep pace with the demands of the desktop publishing environment. The potential is there if they would just act on it.

Jack E. Horstman
Holt, Michigan



I reviewed the Xerox 6085 in the story, "DOS Meets the Workstation," in *PC Magazine* back on June 10, 1986. Unfortunately, the machine cost \$10,000 and took 15 minutes to boot!—*Bill Machrone*

SLOTH CITY

I was disappointed with John Dvorak's comments in the March 31 issue. After reading his "A Future of Sloth" article, I felt I could not have agreed with him more. Certainly, automation has been abused and relied on to the point (in some cases) where math ability and concerns of quality have diminished. Soon, as he noted, with voice recognition, writing quality may follow suit.

Then I reached the end of his Inside Track column and read his praise for the CD-ROM compilation of *Monarch Notes*. This kind of easy-answer automation is leading to the disintegration of the ability and desire to read, understand, and write fine literature. And what's the excitement over the cut-and-paste feature (inviting an opportunity to plagiarize)?

William T. King
Franklinville, New York

Surely, there must be two John Dvoraks. After he says that "most children have become addicted to calculators" and that "math skills [have been] killed off by the calculator" he throws his love and affection to a CD-ROM that contains a complete set of *Monarch Notes*, designed specifically for students who have no desire whatsoever to read "the great literature of the world."

How does Dvorak expect these students to be able to write when he suggests that they not bother to read?

Andy Bender
Los Angeles, California

ABOVE AND BEYOND?

PC Magazine goes way beyond the needs and budgets of many of its readers when it covers full-blown cover stories on 40-MHz 486s, Super VGA video systems, and so on. They deserve press, but not big feature stories.

This "ultralight"
portable PC mania is
nuts. Anyone who
can't handle an extra
half-pound needs
prompt physical or
psychiatric therapy.

Recently, I was in the market for a tape drive. Nothing fancy, just a reliable, inexpensive 200MB tape backup. Guess what I couldn't find reviewed in the last couple of years?

If *PC Magazine* runs another multimedia issue within the next year (you've already had two in a few months), cancel my subscription.

Dave Cohen
RTP, North Carolina (DBLinX)



We just did a feature article called "Minicartridge Tape Backup: Simple, Inexpensive, and QIC," in the April 14, 1992, issue. As for 40-MHz 486s, Super VGA, and multimedia: We have an obligation to cover new, state-of-the-art technologies.—*Ed.*

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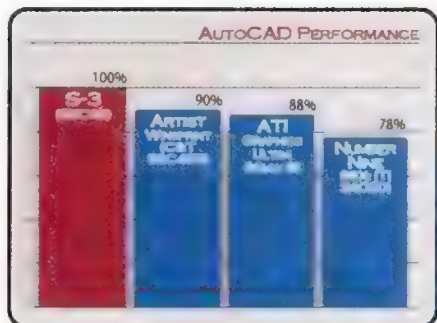
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In PC Magazine's latest comparison of video chip performance tests running AutoCAD, the S3 based accelerators outperformed the competition, including the ATI Graphics Ultra, in all 10 categories except redraw where the TI 34020 took the lead. Graph based on AutoCAD performance test results PC Magazine 3-17-91.

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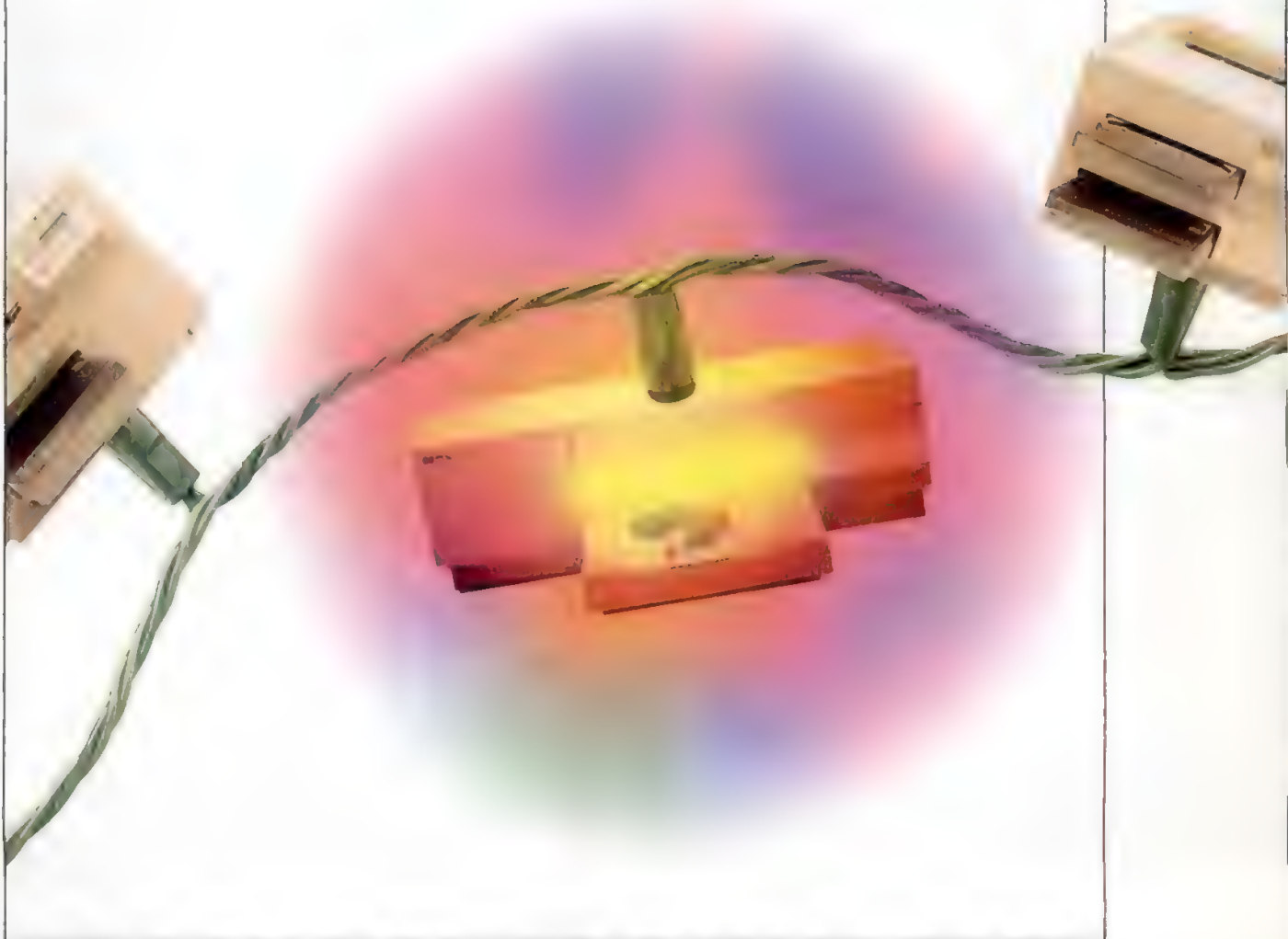
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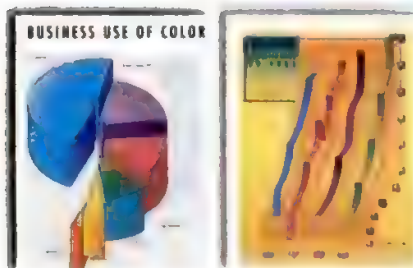
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Letters

FLOPPY DISK PROTECTION

I'd like to address the many software companies from which I receive floppy disks through the mail. *Bent floppies are unreadable!* I get several demo programs each week. As a consultant, these are very useful to me in evaluating a program. The 3.5-inch disks travel well, but 5.25-inch floppy disks are a different story. I would think software publishers would be more concerned about the condition of the demos they send. Only a handful use diskette mailers to protect the disk. Diskette mailers work. Loose 5.25-inch disks or disks inside pamphlets or catalogs do not. Protect those disks. If I cannot use the demo, I cannot recommend the software to my clients.

Norbert L. Smith
New Waverly, Texas

AFTER WORDS

I must congratulate *PC Magazine* on what is becoming the best part of the magazine: the After Hours section! In a few pages, the best of entertainment and children's programs are very nicely reviewed. Keep up the good work! One small criticism: When reviewers mention their children, they usually do not say how old they are. This is true for the columnists as well.

Robert M. Johnson
Maryland Heights, Missouri

BACK-TO-BACK COLUMNS

I have been tearing out and filing the columns in *PC Magazine* for years. You have facilitated that practice by not printing one article on the back of another. In the March 31, 1992, issue, I found that some of the columns are printed on the back of other columns. You seem to have more than enough advertising to avoid this practice. Could you please return to your original practice?

Oliver W. Cass
North Oaks, Minnesota

MATH MISHAP

There was a mistake in your March 31, 1992, First Looks review on *Mathematica for Windows*. Math you may know, naming objects you know not. The screenshot identified as "...this hyperbolic icosahedron...", is in fact a (hyperbolic) dodecahedron. The dodecahedron is a 12-sided polyhedron with each face

a pentagon, while an icosahedron is 20-sided, with triangular faces.

Jeremy H. Jordan
Lincoln, New Mexico

AN EXTRA DAY FOR THE CZAR

I have solid proof that *Lotus 1-2-3* was written by czarist programmers. Try the following: Format a cell as Data 1, width 10 or more, and enter the datecode 60. Suprisingly, you will get: 29-Feb-00 (February 29, 1900). 1900 was not a leap year, except in pre-Communist Russia, which stubbornly used the Julian calendar until the Revolution of 1917.

Ron Gerald Landmann
Fair Lawn, New Jersey



Some people look back, others look ahead. 29/Feb/00 is a date that will occur in the year 2000. It falls on a Tuesday.—Ed.

CORRECTIONS & AMPLIFICATIONS

In the April 14, 1992, New & Improved Briefs, we should have stated that Lazy Dog Foundry can take your handwriting and convert it to a laser font. The price for 90 characters is \$179. The price for 150 characters is \$350. The toll-free number is 800-876-9807.

The correct phone number for Hewlett-Packard, whose HP ScanJet IIc received an Editors' Choice award in our recent scanner evaluation ("True-Color Performance at Gray-Scale Prices: Nine Desktop Scanners That Do It All," April 14, 1992) is 800-752-0900. Also, the phone number published for Chinon America should have read 800-441-0222.

The correct phone number for Masque Publishing (*Masque Black-Jack for Windows*, After Hours, April 14, 1992) is 800-765-4223.

HOW TO WRITE TO PC MAGAZINE

We welcome your comments and suggestions. Please send correspondence to Letters, *PC Magazine*, One Park Ave., New York, NY 10016, or upload it to PC MagNet (see page 10 for access information). All letters become the property of *PC Magazine* and are subject to editing.

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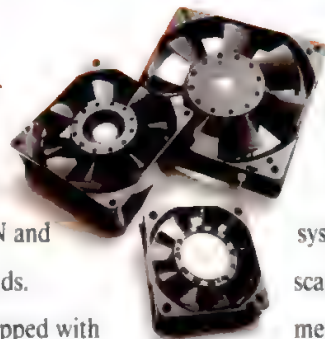
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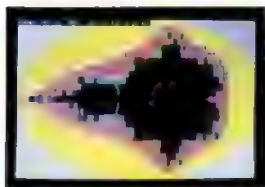
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Trends

Trends & Technology Shaping the Personal Computer Market

Takin' Care of Business, PC Style

Personal computers are shaking up the deeply ingrained culture of day-to-day dealings, and business may never be the same.

Take the venerable act of exchanging business cards, for example. Hewlett-Packard and Contact Software International (Carrollton, Texas) have come up with a novel twist. When two HP 95LX palmtop computers meet and they are both running the \$149 *ACT! for the HP 95LX* software, the machines can swap business cards electronically. Just line up the infrared ports on both 95LXs, press Ctrl-Z (for Zap), and your information is exchanged. Or you could decide to trade entire lists of contacts from one machine to another. *ACT! for the HP 95LX* comes on a floppy disk and includes a cable for downloading the program from your desktop to the HP palmtop. It is file-compatible with all other *ACT!* software and is the first package to make use of the 95LX's intriguing infrared facility.

Before the end of the year,

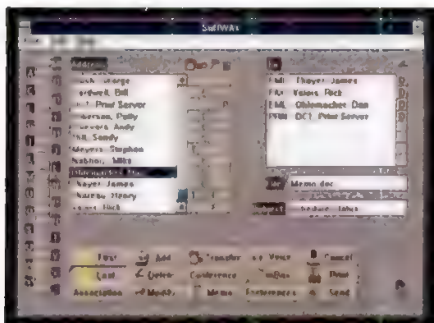
OCTus, Nolan Bushnell's San Diego-based company, plans to deliver the ultimate office communications manager, called *SuBWAY*. Bushnell created visionary products such as the original Atari, the first video game (*Pong*), and Chuck E. Cheese, a chain of wacky pizza parlors.

OCTus calls *SuBWAY* a GCI (graphical communications interface). The company hopes the Windows environment will integrate print, fax, e-mail, teleconferencing, and dictation at a single desktop station. An early prototype of the system consists of a space-age-looking telephone handset/keyboard/scanner attached to the computer (the scanner is just the right size for scanning business cards). A Rolodex-type paradigm serves as the backbone of the system.

SuBWAY will prompt you for information about the people you want to contact and how you want to contact them. And it will let you set up conference calls, screen incoming calls, and even dictate memos or annotate messages for transmission.

Even the power lunch promises to go electronic as personal finance software developers, such as Intuit, team up with credit-card companies. Imagine getting your credit-card bills on a floppy disk, automatically reconciling your accounts, and then paying the bills through a program like *Quicken*.

—Robin Raskin



The upcoming *SuBWAY* station will integrate print, e-mail, fax, and teleconferencing.



Newton, Apple's first personal digital assistant, will weigh about a pound and cost around \$500.

Apple's Newton Falls Far From Tree

Newton, Apple's next computer, won't look like a computer at all. Based on a new low-powered RISC processor from Advanced RISC Machines, Newton is Apple Computer's first personal digital assistant (PDA). The term describes, among other things, hand-held computers that are pen-based, cost less than \$700, operate on batteries, and will be a lot more powerful than today's palmtops from Casio, Hewlett-Packard, and Sharp.

First touted by Apple's chairman and CEO John Sculley earlier this year, PDAs are being developed in earnest in California's Silicon Valley. Eo Computer, started by ex-employees of pen operating-system maker GOCorp., is reportedly working on a PDA that is expected to use a RISC chip, code-named "Hobbit," from AT&T. General Magic is working on the Personal Intelligent Communicator, where the key feature is communication, probably wireless. No PDAs will be available until early 1993.

Packaged in a sleek case, Newton is Apple's foray into mass-market consumer electronics. While Newton will be targeted toward business users, it won't run desktop applications. It will come with the Newt operating system (non-Macintosh-compatible) and PIM-type applications. The base application is a name and address database, to-do list, and calendar. The screen is a digitizer that uses Apple's handwriting-recognition software.

Newton will use solid-state storage and will have a PCMCIA slot that will accept new cross-platform cards, which should work with DOS PCs. Apple is developing Newton in partnership with Sharp, which is also expected to release a version. Newton will weigh about a pound and cost around \$500.

—Christopher Barr

Intel Embraces XGA and Local-Bus Video

To jump-start the graphics-intensive applications that everyone is predicting for the future (video conferencing, handwriting recognition, voice annotation, and so on), Intel recently took two important steps: It joined forces with IBM to establish XGA as the next graphics standard, and began working with VESA to define specs for putting peripherals, such as video controllers, on the local bus (which, because it runs at CPU speed, is much faster than the 8-MHz I/O bus).

"VGA is just not appropriate for the video-centric apps of the future," says Ken Fine, general manager of Intel's multimedia

CONTINUES ON PAGE 30

Pipeline

by Gus Venditto

Local Bus Is Ready For Prime Time

Local bus video has been kicking around for some time now as every system vendor tries to work around one of the most vexing problems of the day: Windows 3.1 is still too slow handling text on-screen. The idea behind local bus is that by moving the video controller physically and logically closer to the processor, screen updates will take place faster. The video can run at the same clock speed as the processor, and data transfers are not limited to the bus specification. By including logic that accelerates frequently used Windows functions, such as BitBlts, the problem is pretty much solved.

That kind of approach makes a lot more sense for the average Windows user than expensive video coprocessors, since the real issue in business applications is the speed at which bitmaps, including text, are drawn. Coprocessed video speeds the calculations required for drawing shapes; this is a big help if you're doing design work but irrelevant in most word processing and spreadsheet apps.

The idea is so compelling that a growing number of system vendors have been changing their motherboards to link video with the processor, or modifying processor cards to include video (see the review of the NEC PowerMate 486/33i in the May 12, 1992, issue, page 48). Those solutions result in a doubling or tripling of basic Windows video performance, but they have the drawback of limiting you to today's video standard. Or, if the local bus is on a card, they'll force you to replace your processor in order to upgrade the video—if such an upgrade is ever offered.

A more forward-thinking solution is on the way from companies that will conform to a specification from VESA (Video Electronics Standards Association), the people who saved Super VGA from turning into a modern Tower of Babel. They hope to finalize guidelines in late June for an extension to the ISA and EISA architectures—called the VESA Local (VL) Bus—that will make it possible to have several local bus slots in a system.

VL bus slots will do more than make it possible to upgrade your video down the road. They will also make it possible to expand the local bus to another peripheral, such as a hard disk caching controller, network card, or a real-time video board. The ideal local-bus system will come with three slots, only one of which will be occupied by a video card. The VESA spec includes guidelines for bus mastering, so that the boards work cooperatively.

But the VL bus won't be the last word in extending ISA and EISA. Intel is proposing a more far-reaching version of local bus, called the Peripheral Controller Interface (PCI), that makes special allowances for real-time video—especially Intel's DVI (Digital Video Interactive) products, which someday will do for video in the office what the camcorder did for video at home. It is likely that VESA will also adopt PCI, and systems that use both buses are likely in the future.

The VL bus isn't perfect. Systems with video on the same planar as the processor will be faster. But there's such broad agreement among manufacturers of both systems and peripherals that the VL bus is the smart way to go that you can expect to see a flood of VL bus products in coming months. ■

Gus Venditto is the editor of PC Sources magazine and a contributing editor to PC Magazine.

and supercomputing components group. "In the future, apps will have lots of natural data," he says. Examples of natural data include "the spoken word, handwriting, and visual images that aren't synthetic: that is, that haven't been generated by a computer."

VGA-compatible XGA, which stands for Extended Graphics Array and was introduced by IBM two years ago, is robust enough to handle these upcoming apps, according to Fine. "There's lots of room to grow. Today's implementation of XGA has a resolution of 1,024 by 768; the spec goes up to 4 million bytes. Today's XGA has only 8 bits, but the spec goes up to 32. Today's is interlaced."

Fine says Intel, which is taking over the design of XGA, will focus on three areas: evolving XGA's basic functionality; integrating it onto a chip with other capabilities, such as DVI (Digital Video Interactive) and even possibly x86; and the local bus connection.

Intel hopes its local bus connection, called the Peripheral Controller Interface (PCI), is adopted by VESA (Video Electronics Standards Association), which has its own local-bus spec, called the VESA Local Bus (or VL bus). The two connections are different enough that they will never be one, but it's likely that the VL bus (which has three slots) would plug into the PCI bus (which has ten slots and is

reportedly integral to the architecture of Intel's upcoming P5 microprocessor).

How all this may come together is illustrated by Warren Lee, president of Alpha Research Corp., an Austin-based hard disk controller start-up that is helping VESA expand the VL bus beyond video. "I can imagine a multiprocessor high-performance animation workstation," he says, "the kind of machine you'd use to create Disney animations. On this machine, the VL bus would take care of the visual front end—updating the screen constantly—and the PCI bus would handle the communication among the processors."

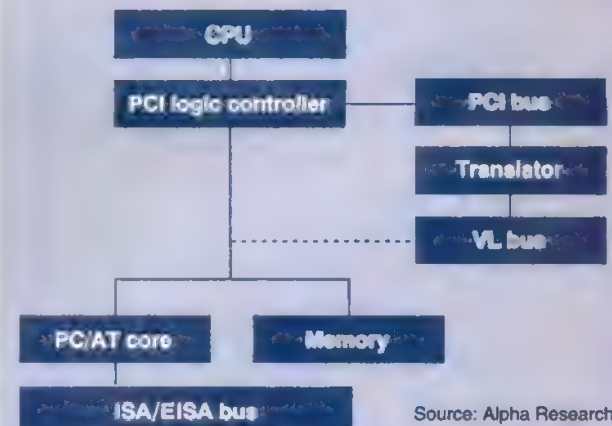
—Mary Kathleen Flynn

IBM Lends Credibility to Cellular Comm

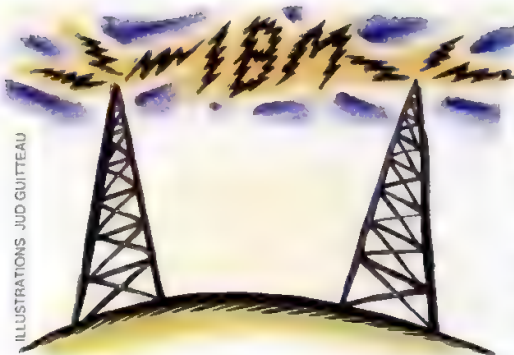
Celluplan II, IBM's recent alliance with nine communications companies to define a nationwide cellular data network, gives a respectable sheen to technology that may yet seem a little exotic to the end user. The ultimate goal is to give the computer user the ability to send and receive data, messages, and files without having to plug in a telephone line. Users gain the security of big names working together to ensure wider coverage and (possibly) lower prices than previously imagined for cellular data transmission;

Systems of the future might have more than one local-bus connection.

Ultimate Architecture



Source: Alpha Research Corp., Austin, Texas



network to go nationwide, uses a network of proprietary relay stations to transmit its cellular signals. The company recently announced that it would open its protocol to other developers.

RAM Mobile

Data's Mobitex network uses proprietary stations to relay packet-radio signals from cellular modems, such as Ericsson GE's Mobidems. Motorola recently said it will add Mobitex compatibility to its line of cellular modems. With all four network proprietors touting openness, it's likely that future modems will work on a wide variety of networks, bringing us even closer to true global wireless communications.

—Angela Gunn

Flash Memory: Death Knell for Hard Disks?

Portable computing recently got another shot in the arm when Intel brought out its Series 2 Flash Memory Card, which can hold 20MB of nonvolatile data (five times the previous generation) and is priced on a par with DRAM (half the previous price). Just days later, AT&T announced its own line of flash memory cards.

Intel's Series 2 Flash Memory Card is the size of a credit card and holds 20 1-megabyte chips. It fits into the PCMCIA (Personal Computer Memory Card International Association) slot on portable PCs.

The new card has some advantages over the 1.8-inch submini hard disks from companies such as Integral and Conner Peripherals. (See Trends, January 14, 1992.) "It's a quarter of the volume, half the weight, ten times the reliability in mean time between failures, and 100,000 times the reliability in shock specs," says Intel senior vice president Dave House. "And it only uses 5 percent of the power." However, it is twice as expensive as today's 1.8-inch drives.

As good as it sounds, Intel does not expect flash memory to replace DRAM completely. "While flash is fast in reading, it's slower in writing," he says. "So applications such as graphics that need to constantly replace individual bytes will also need DRAM. But flash is great for things like program storage. It's so fast that apps can reside in it instead of in memory."

AT&T's cards will plug into an IDE-compatible controller, which will let notebook PC vendors use them as replacements for 2.5-inch hard disks without changes to the operating system. The company expects to offer Intel-like flash cards later in 1992.

Microsoft is lending support to flash as part of its Portable Computing Initiative. Microsoft has released specifications for the Flash File System, which will allow flash memory to function as an ordinary disk. Saul Zales, Intel's flash technical marketing manager, says this is especially important because the Flash File System is independent of any operating system. That could potentially mean easy file sharing between PC and Macintosh, or even Unix users.

—Mary Kathleen Flynn

Toolbars: Software Steroids

Windows applications and the menu bars that come with them won't be completely customizable until Microsoft develops a universal macro language that works across all Windows applications. That won't happen until OLE 2.0 is finished and adopted by the independent software vendors who write the programs.

In the meantime, we're starting to see tools that help you customize those icon palettes, toolbars, speed bars, and SmartIcons.

The Power Bar, a part of hDC's *Power Launcher 2.0*, and *SideBar*, from Paper

Software of New Paltz, New York, each place a customizable toolbar on your Windows screen.

The Power Bar sits at the top of your screen and shows seven customizable icons at a time (Super VGA displays let you have 15). Each icon can be customized by editing an .INI file, and the utility gives you access to the potent tools in *Power Launcher* that let you assign complex commands to each icon.

From the Power Bar you can create custom toolboxes for any Windows application, launch DOS commands without having to drop to DOS first, and get instant access to the Windows

Top 15 Software Sellers at Retail

Current Ranking		Last Issue
1	Microsoft Windows 3.1 Upgrade Microsoft Corp.	1
2	Microsoft Windows 3.1 Microsoft Corp.	2
3	Microsoft DOS 5.0 Upgrade Kit Microsoft Corp.	5
4	Excel for Windows 4.0 Microsoft Corp.	-
5	Excel for Windows 4.0 Upgrade Microsoft Corp.	-
6	QEMM-386 6.0 Quarterdeck Office Systems	7
7	WordPerfect 5.1 for DOS WordPerfect Corp.	6
8	Quicken 5.0 Intuit	4
9	Procomm Plus 2.1 Datastorm Technologies	3
10	Stacker 2.0 Stac Electronics Inc.	8
11	Word for Windows 2.0 Upgrade Microsoft Corp.	12
12	Grammatik 5 for DOS Reference Software	-
13	Microsoft Office for Windows 2.0 Microsoft Corp.	-
14	WordPerfect for Windows Trade-Up WordPerfect Corp.	-
15	The Norton Utilities 6.01 Symantec Corp.	-

The list ranks PC business programs according to the total number of copies shipped to stores and resellers in the week ending April 25, 1992. The list is based on shipments to more than 12,000 retail locations. It does not include sales made directly by software publishers and cannot be interpreted as a picture of the entire software market.

Sales information compiled by Ingram-Micro.

the software and hardware developers gain validation of the products they have already developed.

Joining IBM are the nation's two largest cellular carriers, six of the seven Baby Bells, and Centel Cellular, a Chicago cellular supplier. The nine companies plan to test their network in central California this summer and hope to implement the system nationwide in 12 to 18 months. Additionally, the consortium is "opening" the protocol by making the technical specifications available to third-party developers.

Celluplan II will use the nationwide network of cellular relay towers already in place. Specially designed modems will broadcast data to control boxes installed at the present cellular stations. The control units will insert packets of the data in unused voice bandwidth channels within the FCC-specified cellular radio-frequency range and transmit it at 19.2 Kbps.

Celluplan II does not offer great improvements in technology. Companies such as Ardis and Cellular Data use data-transmission methods that are on the whole more responsive to the problems of moving data across a cellular link than that which Celluplan II is proposing. Cellular Data Inc. (CDI), a start-up firm, also depends on Bell's relay network. But while Celluplan II utilizes the entire cellular bandwidth, taking its transmission opportunities where it can find them, CDI's system relies on an FCC-approved allocation of unused bandwidth in the "buffer" zones between voice bandwidth suballocations. The CDI system can move data at just 2,400 bps and uses 200 milliwatts of transmission power.

Ardis, an IBM-Motorola partnership and the first radio-data

BRIEFS

■ **Closing the (Generation) Gap:** By bringing Digital Equipment Corp. into the Windows NT camp, Microsoft may have added a key weapon to its arsenal against former partner IBM: credibility with corporate customers. IBM has done a good job making corporate MIS managers believe the company is on their side. Remember the old saying, "Nobody ever got fired for buying IBM." But Microsoft grew up out of the PC revolution, which threatened centralized mainframe-based MIS departments a decade ago. Enter DEC. With its solid number two position in the global computer market, and its impressive following of Fortune 1,000 customers, DEC may help mediate the corporate culture clash between MIS managers and Microsoft.

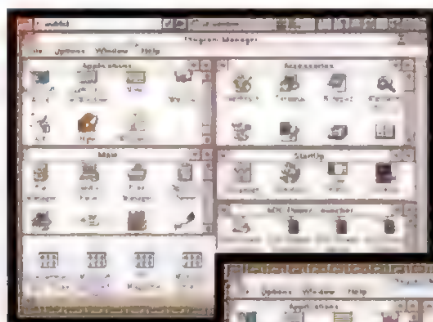
■ **Removability is Back:** Flash memory isn't the only storage technology to promise rewritability, portability, speed, and miniaturization; the hard disk itself has gone removable. SyQuest Technology (510-226-4000) is selling removable Winchester disk drives that perform on a par with fixed disks and provide infinite storage capacity to systems vendors. SyQuest's new 2.5-inch 43MB removable drive for portable PCs should cost only 20 percent more than a fixed drive. The company's 105MB 3.5-inch drive for desktop PCs provides two to three times the performance of a rewritable magneto-optical drive for about one third the price. This fall, drives should start to show up in Bondwell's portables.

■ **Managing the Network:** Major network vendors are taking a cue from smaller companies such as Optical Data Systems Inc. and Network by offering file servers for wiring hubs. Ungermann-Bass (partial owner of Network) brought out the \$7,990 Access/Open, which lets network managers integrate server-based apps under the same management scheme as components.

—Mary Kathleen Flynn

File Manager. The Power Bar keeps an eye on your system's resources with a live graph that changes colors as you reach the upper limits.

SideBar, the less powerful of the two utilities, is a mini-Windows shell. You can view it as either one or two panes, and the



Toolbars in HDC's *PowerLauncher 2.0* (above) and Paper Software's *SideBar* (right) let you customize Windows.



panes provide either a graphical view of your disks or a textual listing. Files you open often can be moved to *SideBar* and launched with a double click of the mouse. You enter DOS commands by typing them in a command window.

—Christopher Barr

LANTastic to Get More Flexible

Faced with a market that increasingly demands interoperability, Artisoft has moved to buy more flexibility for *LANTastic* through its recent acquisition of Performance Technology. Artisoft plans to use Performance Technology's products to enhance the ability of its low-cost *LANTastic* network to work with Novell's *NetWare*, Microsoft's *LAN Manager*, Banyan's *VINES*, and TCP/IP.

Performance Technology, a privately held San Antonio-based company, markets products like *POWERfusion*, which links DOS-based LANs to computers running Unix, and *POW-*

ERbridge, which connects *LANTastic* networks to those running Novell's *NetWare*. The company has expertise that Artisoft lacks in the Server Message Block (SMB) protocols developed by Microsoft and IBM. SMB is used between client PCs and servers in Microsoft's *LAN Manager* and in Banyan's *VINES* network operating systems.

Although it is fast and easy to use, some organizations resist *LANTastic* because it lacks good links to other

network operating systems. While the current "*LANTastic* for *NetWare*" isn't fully compatible with Artisoft's standard version of *LANTastic*, *POWERbridge* provides an invisible and backward-compatible link. This acquisition gives Artisoft the ability to make *LANTastic* into a multiplatform network operating system quickly, to improve its interoperability with *NetWare*, and to bring SMB into the product line.

—Frank J. Derfler, Jr.

Sampling Sound

While the emergence of multimedia standards has boosted consumers' interest in going beyond beeps and bleeps on their PCs, finding which boards produce the best sounds can be difficult. In the consumer market, audiophiles have the benefit of manufacturers' specs, which measure qualities

like signal-to-noise ratio and total harmonic distortion. But the PC audio market is still so new that it lacks standard specs. Even worse, some of the published specs are suspect.

Most of the sound clips readily available to try out audio boards aren't recorded at sampling rates high enough or sample sizes large enough to exploit the best boards. This makes it very hard for PC users and developers who need high-end sound sampling (for digital recording, editing, and mixing) to compare products before buying one. It's like testing VGA displays when all you've got are CGA images.

Turtle Beach recently took one step toward solving this problem. For a mere \$3, the company sells the Audio Taste Test, a CD-audio disk that contains sounds recorded by different boards along with an instructional narrative (717-843-6916). It's clearly a promotional gimmick to show off Turtle Beach's MultiSound board, replete with digs at competitors like Creative Labs (Sound Blaster) and Media Vision (Pro Audio Spectrum). Nevertheless, the Audio Taste Test demonstrates dramatic differences between low-end and high-end boards.

The next step would be for manufacturers to distribute CD-ROM disks that contain MIDI files and waveform audio files recorded at a 44.1 kHz sampling rate with 16-bit samples (in other words, CD-audio quality). Smart shoppers would still have to ask which board was used to make the recordings, but armed with the right sound clips, buyers could hear for themselves before they buy.

—Mary Kathleen Flynn and Charles Petzold

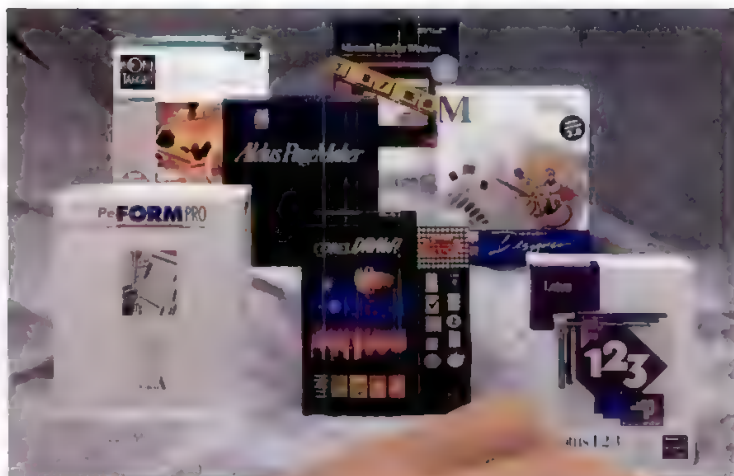


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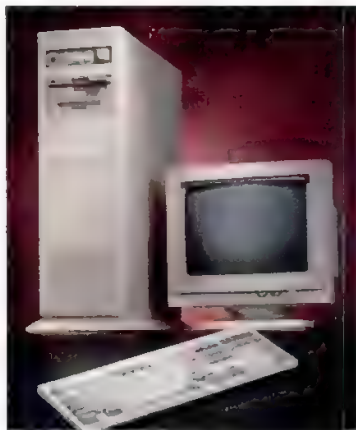
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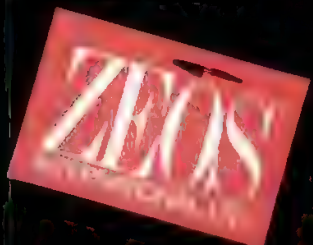
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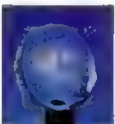
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First Looks

Hands-on Reviews of the Latest Products

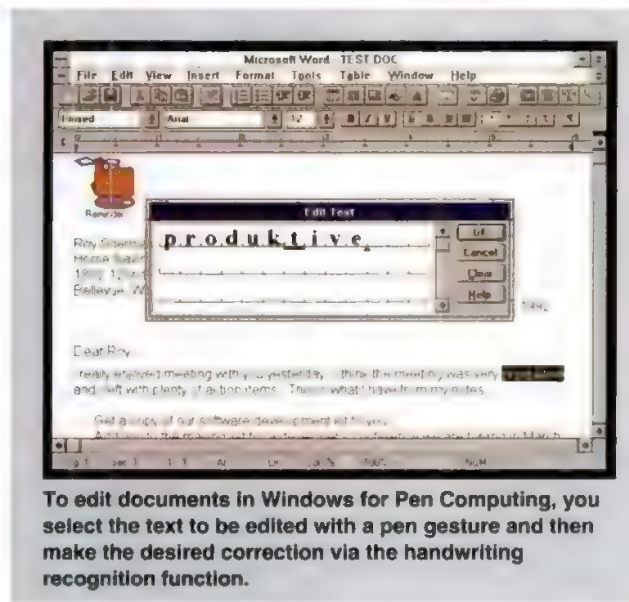
On Your Marks! PenPoint and Windows for Pens Race for Pen Dominance

HANDS ON
by Bruce Brown

Here we go all over again. The advent of pen-based computing brings with it the need to make many decisions about operating environments, hardware, and applications. These choices will change the way many of us use computers.

Pen computing vendors are split into two camps. One group sees the pen as an additional tool that gives more value to the applications we all use today. Others see the pen as a way to get millions of people to use PCs for the very first time. Conventionalists talk of maintaining user and corporate investment in current data and software. Market expanders speak of "new uses for new users."

At this relatively early stage in pen computing history, the operating system winners are



To edit documents in Windows for Pen Computing, you select the text to be edited with a pen gesture and then make the desired correction via the handwriting recognition function.

already becoming apparent. GO Corp.'s PenPoint, Version 1.0, a market expander, and Microsoft Corp.'s Windows for Pen

Computing, Version 1.0, a protector of current software investment, are the dominant pen-based operating systems.

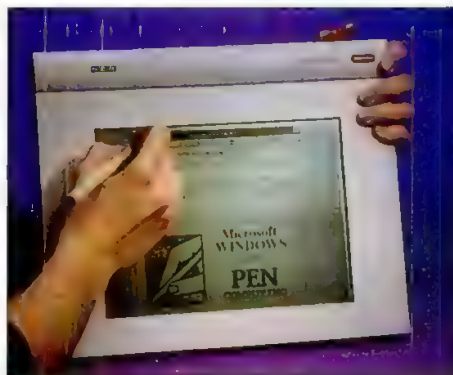
Darkness and Light: NCR's 3125 Is the Right Size but Needs a Brighter Screen

HANDS ON
by Bruce Brown

NCR's 3125 pen-based system is a good value that will get better. The smallest and lightest of the announced full-screen pen computers, the 3125 was the first one out of the blocks, and that fact alone will guarantee it some success. Some of the system's other strong points also earn it high marks.

The 20-MHz 386SL-equipped

3125 is expensive, especially when you compare it with notebook computers. With 2MB of flash memory as its only storage, the 3125 lists for \$4,765. A second configuration with a 19-millisecond 20MB ALPS hard disk costs \$4,795. Our test system, priced at \$5,965, had 8MB of RAM and a hard disk. Expensive indeed, but discounts and expected rapid price erosion should bring prices down by the time you're ready to buy.



PLENTY OF PERIPHERALS

The 3125 comes with a non-backlit VGA LCD screen offering 16 shades of gray, backed by a Wacom electromagnetic dig-

itizer and a cordless pen. Other standard equipment includes a nickel cadmium battery pack, an AC adapter, and an I/O connec-

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PREINSTALLED OS

The two operating systems have several things in common. First, both are sold preinstalled on hardware. If you want PenPoint or Windows for Pens, you have to buy a pen PC with one of the operating systems (or possibly both) installed.

The installed versions of the operating systems are customized for a specific host system and its digitizing technology. You can't copy an operating system

CONTINUES ON PAGE 38

Is this your
next computer?
The 4.5-pound
NCR 3125 pen
PC has a 20MB
hard disk and
costs between
\$4,765 and
\$5,965,
depending on
the options
you add.

First Looks

Pen OS

CONTINUED FROM PAGE 37
to a different pen PC.

Both operating systems are scalable, though to different degrees; they are able to run on systems with different form factors and screen sizes. Smaller windows in Windows for Pens require that you scroll horizontally; in PenPoint, the screen content realigns itself more completely.

Using one of several digitizer technologies, both the Microsoft and GO products use the pen as a replacement for both the mouse and the keyboard. While both products include handwriting recognition (HWR) engines, each also comes with an on-screen graphics keyboard you can turn on for slightly more conventional input.

Both PenPoint and Windows for Pens use pen gestures drawn on-screen as editing and operational shortcuts. There are unique gestures for actions such as delete, undo, insert, and edit. The sets of gestures are not the same, and each vendor says its gestures are more natural. PenPoint can't be taught new gestures, but Windows for Pens can.

For this review, both PenPoint and Windows for Pens were used on separate NCR 3125 pen PCs, each with 8MB RAM and a 20MB hard disk.

PenPoint

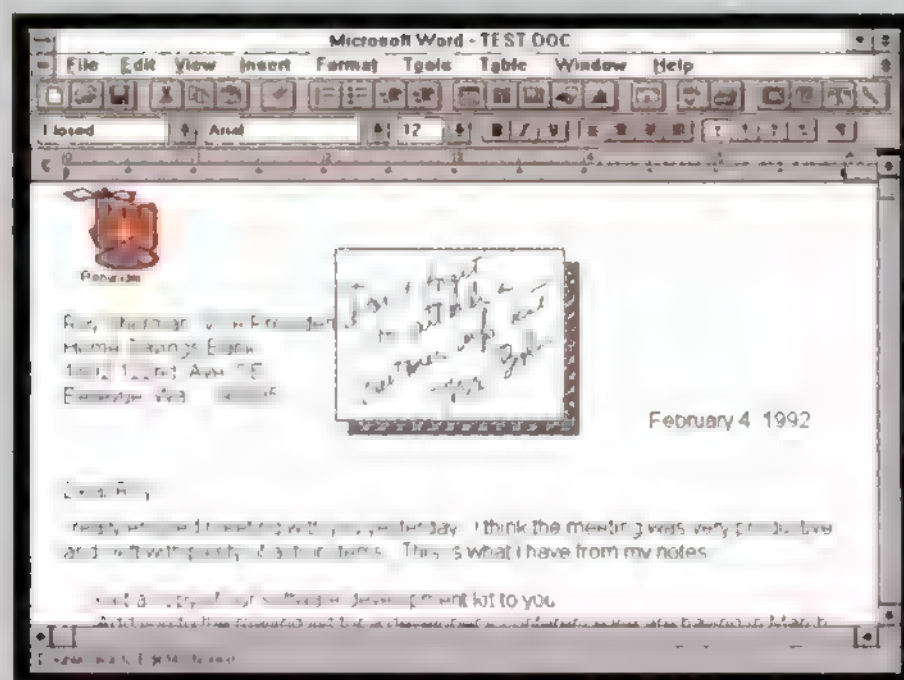
PenPoint is easier for new PC users to grasp than Windows for Pens. It was designed to be natural for people accustomed to working with notebooks and clipboards. In PenPoint, you pick up the pen and just start pointing to move between documents and applications. To close any PenPoint element, you press on the upper-left corner of any document or notebook.

PenPoint's very pen-centric interface lets you rely solely on pointing the pen accurately. The downside of inventing this brand-new interface, however, is that GO has to provide drivers for everything. For example, as of this writing, the only printing devices supported are Epson-

compatible and HP LaserJet-compatible printers along with fax printing.

Booting PenPoint on the test machine took more than 7 minutes. The boot time varies with

step process, unlike the two-step regimen you may have learned in Windows. You don't need to select an icon and then activate it using two pentaps. PenPoint's simplicity seems more sensible



Windows for Pen Computing uses OLE to add elements to conventional Windows applications. The Microsoft Note-It pen utility is used to insert a jotted note in a *Word for Windows* document.

the number of installed applications, since each opens when the system comes up.

PenPoint's opening interface displays a small group of icons on the bottom of the screen. There are separate icons for system help, accessories, the graphical keyboard, the communications in box and out box, system standby and shutdown, connections (disk drives), settings, one or more notebooks, and stationery. You can add icons anywhere on the screen to call up applications or specific documents.

PenPoint is a document-oriented environment (rather than an application-oriented environment). When you select a PenPoint document or part of a document, the system automatically opens the application that created the document.

LIKE A NOTEBOOK

Most of the time you work with notebooks in PenPoint, represented as the spiral-bound type with tabs on the right. You can create as many tabs as you want and use the collapsible outline, which looks like an index, as a menu. Tabs represent documents connected to applications.

Selecting items with the pen in PenPoint is a one-tap, one-

than Windows for Pens here.

There are 11 basic PenPoint gestures (such as a flick of the pen anywhere on-screen to scroll the page), 15 text-editing gestures (such as a capital B to make selected text bold), and six title line gestures used for other operations (such as finding text or adding tabs).

PenPoint is not a DOS-compatible environment, so you can't run DOS software under PenPoint. But PenPoint is able to save files to floppy disk in DOS application formats, and several PenPoint applications automatically load and convert files from major DOS applications. Although you can use many DOS program files with PenPoint applications, it's not nearly as convenient as Windows for Pens is.

NETWORKING AND COMMUNICATIONS

PenPoint's networking features are not yet complete and lack the all-important *NetWare* capabilities. But PenPoint's preemptive multitasking allows for connections to multiple networks and communications protocols simultaneously. PenPoint comes standard with TOPs protocols built in, and third-party add-ins include 3270 and other communi-

cation protocols.

PenPoint's deferred communications facility waits for connections to be made or for disrupted communications to be resumed. It's easy to attach or detach from a LAN with no fuss. You can imagine walking into range of your wireless LAN and having your pen PC automatically start to send and receive your e-mail.

If you require *NetWare* connectivity or just want to extend your DOS/Windows-based computing to the new world of pen computing, PenPoint is not the better solution today. But PenPoint's native environment is simpler for new PC users than Windows for Pens and doesn't require any previous computer operating system or application experience. All PenPoint applications maintain the notebook metaphor, and users benefit from that standardization.

Microsoft Windows for Pen Computing

Windows for Pens is the hands-down winner if you want to add pen input and handwriting recognition to existing Windows applications or if you use a mix of DOS and Windows programs. Microsoft's assertion that Windows for Pens protects your current investment in data and software better than PenPoint isn't arguable.

Microsoft has the mixed blessing of an installed base of almost 10 million. All those Windows users bring with them the requirement of compatibility with a vast array of previously existing features, applications, and utilities. But the prevalence of Windows is also a great asset: Windows for Pens already has a vast number of printer drivers and support for many other devices as well.

Windows for Pens users who already know Windows will find it easy to incorporate pen operations with Windows software. The menus and screens are the same as in regular Windows.

If you want to start using a pen gradually, you can use it as a more convenient mouse. Rather than clicking once or twice with a mouse, you just tap once or

twice with the pen. To drag an item, you press and hold the pen tip while you move it. To select text, you press the pen tip down and hold it until a selection point appears on-screen.

HANDWRITING TRAINER

Windows for Pens uses 12 basic gestures for general editing tasks. One of Windows for Pens' advantages is that you can train the system to recognize new gestures. To edit any Windows programs, just draw the Edit Text gesture (a big check mark) over selected text, and the Pen Palette pops up.

The Pen Palette can test your patience at first, but it includes a trainer to improve the handwriting recognizer's ability to read what you write (or rather what you print, one letter at a time). Training works both ways, since you must follow rules for letter size and space. With practice and judicious training, you can become relatively proficient with the built-in handwriting recog-

nition. But no matter how good you get, using the pen palette for anything but editing or minimal data entry gets tiresome. And that's true for PenPoint as well.

FAMILIAR WINDOWS APPS

You can use Windows for Pens with many applications, including conventional Windows programs and a rapidly growing number of third-party programs that are designed especially for pens. The standard Windows Program Manager and File Manager interfaces were not designed for pen computing. With each, the pen is just another input device for an interface designed for mouse and keyboard.

If you use Windows for Pens with existing applications, the clear advantage is that you needn't do any file or data conversion. The files always stay in the same format. PenPoint files, on the other hand, require conversion.

Using Windows for Pens on networks shares the same advantages and disadvantages of

regular Windows. Windows supports NetWare as well as the other major standard network and connectivity protocols. You cannot be connected to more than one standard network at one time, and broken connections are not automatically resumed. (Those are two capabilities that PenPoint does have.)

Windows for Pen Computing adds the pen as an input device and brings fairly easy-to-use handwriting recognition to Windows programs. It can be fun and isn't hard, but whether it adds great value will depend on how extensively you bring pen PCs and pen-centric applications into your computing.

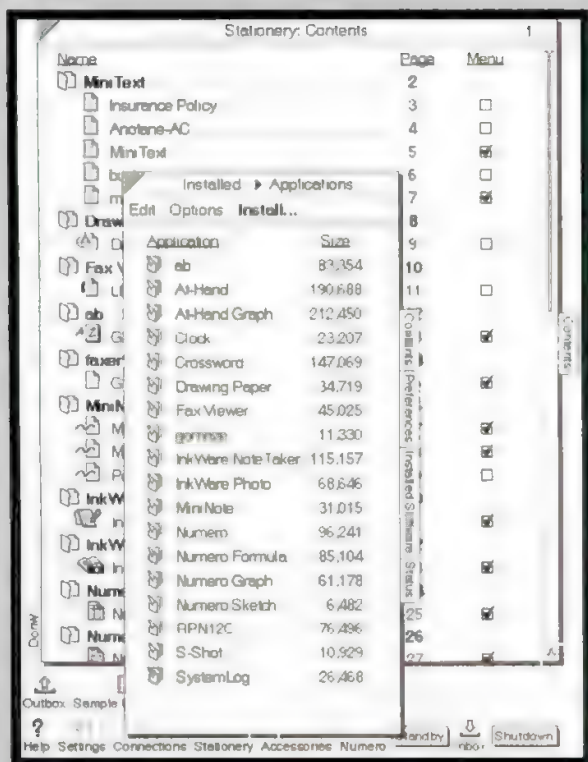
MAYBE THEY BOTH WIN

Microsoft and GO view the rest of 1992, and at least the first half of 1993, as a pilot run, when they'll learn more about how users accept and use pen computing. Programmers and software development houses see great potential in programming for PenPoint, but Windows for Pens is a safer bet for them for the time being. As acceptance of pen computing grows, applications are certain to proliferate for both operating systems.

It's too early to declare either PenPoint or Windows for Pens as the winner in "the OS wars." Coexistence will be the rule as the two operating systems develop. In fact, it's likely that the two will eventually have to communicate with each other.

Today it's clear that if you want to add pen functions to current DOS and Windows applications, Windows for Pen

LITTLE GESTURES	
Both Microsoft Windows for Pen Computing and PenPoint require you to learn between 10 and 20 core pen gestures that help you move around in the operating system and edit text. Some gestures are just what you'd expect them to be, but those that are not don't really slow you down. Learning the core gestures takes just a couple of hours. Below are examples of gestures from both operating systems.	
Windows for Pen Computing	PenPoint
 Delete text	 Delete text
 Edit text	 Scroll page up or down
 Backspace	 Open a pad or create a document
 Insert space	 Insert space
 Insert new line	 Set an insertion point (press down)
 Cut	 Delete character
 Undo	 Undo
 Copy to Clipboard	 Boldface text (I for italics, U for underline)
 Paste from Clipboard	 Paragraph break



PenPoint uses notebooks with tabs and icons to organize documents and simplify file and application selections. Using the pen to make and activate choices is a natural one-step process, similar to the way people choose by pointing with a finger.

Computing is the only logical choice. If you are looking for some new ways to automate jobs—especially jobs that involve mobility and forms—then PenPoint may make more sense. ■

List Price: PenPoint, Version 1.0: Not an end-user purchase. PenPoint comes preinstalled on some pen PCs. GO Corp., 919 E. Hillsdale Blvd., #400, Foster City, CA 94404; 415-358-2008.

CIRCLE 430 ON READER SERVICE CARD

List Price: Microsoft Windows for Pen Computing, Version 1.0: Not an end-user purchase.

Windows for Pens comes preinstalled on some pen PCs. Microsoft Corp., One Microsoft Way, Redmond, WA 98052; 800-227-4679.

CIRCLE 431 ON READER SERVICE CARD

First Looks

NCR 3125

CONTINUED FROM PAGE 37

tor adapter with VGA, keyboard, serial, and parallel ports. A nylon carrying case is also included as standard.

Standard software includes MS-DOS 5.0, CIC's PenDOS, *LapLink Pen* (including cable), and your choice of PenPoint or Microsoft Windows for Pen Computing. You can set the system to boot only one operating system or to present a dual-boot screen every time you start the computer.

For \$435, you can buy the alternate pen OS and have DOS (with PenDOS), PenPoint, and Windows for Pens all on the same system. With the 20MB hard disk, you would then have about 5MB of available space. According to NCR, though, most of its present pen system customers want only one pen operating system installed, in order to save space.

4.5 POUNDS, INCLUDING PEN

The 3125 measures 1.1 by 11.7 by 9.7 inches with the battery attached to the back edge. The

machine weighs in at a mere 4.5 pounds including the battery and the pen, which tucks into its own compartment on the front of the case. (It's a good idea to keep the pen safely stored in the compartment when you aren't using it. Replacements cost \$90.)

If you want to, you can carry more: The I/O strip adds 1.4 inches width to the system, the AC adapter weighs just under 2 pounds, and a spare battery (\$90) weighs 1 pound.

The two system configurations fit different needs. If you're going to use a pen PC mainly on the road for one vertical application (filling out insurance forms, for example), you're likely to choose the flash memory version with faster data access and less susceptibility to jostling problems. If you need to run numerous applications all the time, you'll opt for the hard disk version.

The 3125 can hold up to 20MB of memory, using a combination of internal chips and an IC card slot for up to 8MB of flash memory and 12MB of DRAM. Other options include a \$575 fax modem card and a \$350 external 3.5-inch floppy disk drive, either of which plugs into an option slot located on the left side of the system.

If you attach and plug in all the 3125's options—the battery on the back edge, the I/O connector on the right, with video and keyboard cables plugged in, the AC adapter cable plugged in and modem card or floppy disk controller card on the left side—the NCR looks like a computer screen on life support. Chances are, however, you will be totally hooked up like that only rarely.

NO SCREEN GEM

Working with an LCD screen with no backlighting is like going back five years in portable computing history. Unless you're in the right lighting (not too little and not too much), the screen is very hard to see. Since pen computing means using the screen as the primary input device, a dim screen like this is a major drawback.

According to NCR, the biggest group of potential users for this machine valued weight, size, and battery life over screen backlighting, and even when the company introduces a backlit screen version, it will continue to offer the non-backlit model as well.

Writing on the screen's glass surface with the pen is somewhat slippery. NCR is continu-

ing to investigate smooth versus etched screen surfaces.

POWER TO GO

The 386SL chip's power-management features can stretch battery life to a rated 6 hours. Recharging takes 1.5 hours. In suspend mode, the computer can retain the system status for up to five days. Eight hours of battery life would be better for the system's intended audience of mobile professionals, but that won't work with this system's weight parameters and current battery technology.

If the NCR 3125's dimensions and weight are attractive but the passive screen and hard disk size hold you back, look for the next version. Expected early in the third quarter of this year, NCR's next pen system will add a backlit screen and come with a 40MB hard disk. Weight and size will remain unchanged, but battery life is expected to decrease by about 15 percent because of the screen backlighting. The list price for the as yet unnamed and unannounced product is expected to be slightly below the price of the current 3125 (which NCR will continue to offer at a lower price).

Despite its dim screen, the NCR 3125 is still a good choice for pen computing. Its weight, size, availability, excellent service and support network, and adaptability to all the major pen operating systems are points in its favor.

List Price: NCR 3125, with 2MB RAM, 2MB flash memory, \$4,765; with 2MB RAM, 20MB hard disk, \$4,795; with 8MB RAM, 20MB hard disk, \$5,965. Includes MS-DOS 5.0, PenDOS, *LapLink Pen* with cable, and either PenPoint or Microsoft Windows for Pen Computing. 4MB RAM upgrade, \$640; 2MB EPROM internal upgrade, \$700; external floppy disk drive, \$595; extra battery pack, \$90; 2,400-bps MNP Level 5 data and 9,600-bps send/receive fax modem, \$575; leather case, \$250; additional operating system, \$435. NCR Corp., 1700 S. Patterson Blvd., Dayton, OH 45479; 800-225-5627.

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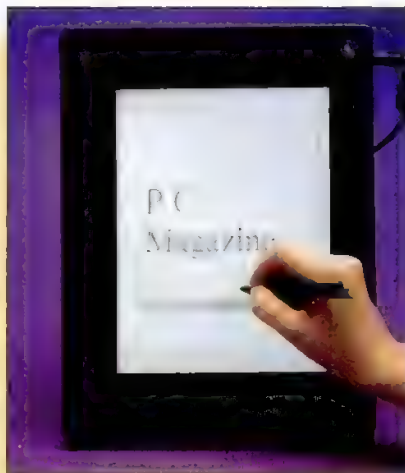
IBM'S THINKPAD PEN PC

PREVIEW by Don Willmott

IBM's entry in the pen PC race is the ThinkPad, a 20-MHz 386SX-based system that's 1.5 inches thick and weighs 6 pounds. The ThinkPad comes with either 4MB or 8MB of RAM, has a transreflective backlit VGA screen with 32 shades of gray, and includes a 2,400-bit-per-second fax modem, serial and parallel ports, an external keyboard port, and the PenPoint operating system. It includes a nickel cadmium battery and has a claimed battery life of 3 hours. Right now, the system is priced at approximately \$5,000.

Thicker than the NCR 3125

reviewed in this issue but thinner than the Microslate Datallite, the ThinkPad is built to last, with a magnesium outer case. Its ruggedness is enhanced by the fact that it has 20MB of Sun-Disk removable solid-state storage on cards, rather than a conventional hard disk. We dropped the ThinkPad from 3 feet to a carpeted floor and noticed no effect. IBM says the system is also water-resistant. Does ruggedness matter? It does if the pen hardware market splits into two camps: sleek executive models versus industrial-strength



IBM plans to be a pen leader. The rugged ThinkPad is its first pen-based system.

systems. IBM hopes that happens, because its pen machines will be ready to go places computing has never gone before. Contact IBM Corp. at 800-426-2468. ■

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NEC's UltraLite SL/20P: Pen Hybrid Is Better for Pointing than for Writing

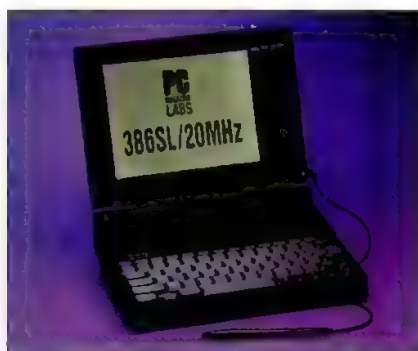


If you're tempted to try your hand at pen technology but don't want to give up traditional computing, consider the NEC UltraLite SL/20P as a low-risk investment for exploring pen computing. The \$3,599 UltraLite is one of the first hybrid notebooks that offers both the computing environment you're familiar with and the hardware and software required for pen computing.

The UltraLite SL/20P is a full-featured portable computing platform in a 6.8-pound package. Inside is a power-saving 20-MHz 386SL processor, 2MB RAM, 16K RAM cache, an 80MB Quantum Go Drive and internal floppy disk drive, and a 640-by-480 VGA display. It's built with all the essential notebook features of the 6.3-pound UltraLite SL/20 (see "High-End Notebook PCs," April 14, 1992), but there are

two critical differences: the TouchPen digitizing hardware built into the notebook's backlit supertwist display, and the pre-loaded pen-compatible software.

On the software side, the package includes MS-DOS 5.0 with NEC's pen utilities and drivers, Microsoft Windows for



The \$3,599 UltraLite comes with Windows for Pen Computing and Windows 3.1.

Pen Computing 1.0, NEC's own freehand drawing program for pen input, and Windows 3.1. NEC also bundles Spinnaker Software's *PFS Windows Work* and plans to bundle Slate Corp.'s *Day-Timer Pen Scheduler for Pen Computing*.

As for hardware, the high-

light of the SL/20P is TouchPen, the on-screen digitizing technology for pen and touchscreen input from MicroTouch Systems.

The components of the digitizer are both inside and on the surface of the Toshiba-built display, which, by all appearances, is a standard 9.5-inch LCD screen with 32 shades of gray. The digitizer's controller for measuring and processing x and y coordinates from the screen is housed inside the display panel.

The combination digitizer and pen writing surface is a glass film overlaid on the LCD's face, and is sensitive to both pen and finger input. The company also claims that since the UltraLite's digitizer is on top of, rather than beneath, the LCD, it achieves better accuracy than the Wacom digitizers used in NCR's pen-based systems. Though the TouchPen technology is the same as that used by GRiD System's GRiDPad, the SL/20P's hybrid design does not offer the comfortable writing room of the GRiD's tablet-size input surface.

PEN AND KEYBOARD

With its keyboard-centric ergonomics, the UltraLite SL/20P is a far less practical platform for pen-centric applications than the Momenta 1/40 pen PC (see First Looks, April 28, 1992). The writing tool is a 6-inch stylus with a 35-inch cord that plugs into the side of the display panel. Writing with it while resting your hand to the side, over, or on top



of the keyboard is neither natural nor comfortable. NEC's approach to pen computing makes the UltraLite SL/20P a far better platform for using the pen as a pointing and "gesturing" device rather than as an intensive "inking" tool. In fact, NEC is marketing the UltraLite as a portable pen applications development and testing system. In April, the company announced support for GO Corp.'s PenPoint Software Developer's Kit.

On PC Labs' benchmark tests, the UltraLite posted average ratings for memory and access speeds when compared with other notebooks in its class. The SL/20P's 12-volt nickel cadmium batteries lasted 1 hour 45 minutes on our Battery Rundown test (with power saving features disabled). Keep in mind that battery life is cut significantly with intensive pen use.

Given the options available for the UltraLite, including a docking station and high-speed internal data/fax modems, its positioning as a development platform may prove successful. What's clear is that the SL/20P is a portable computing environment where DOS, Windows, and pen-based applications coexist with the benefit of processing, power management, and storage features not yet available in pen-centric slates or tablets.

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UltraLite SL/20P

NEC Technologies Inc., 1414 Massachusetts Ave.,
Boxborough, MA 01719; 800-388-8888, 508-264-8000.

List Price: With 2MB RAM, 80MB hard drive, nickel cadmium battery pack, stylus, and TouchPen interface, DOS 5.0, Microsoft Windows 3.1, Microsoft Windows for Pen Computing 1.0, NEC UltraDraw, \$3,599; docking station, \$899; UltraLite Image Plus fax/modem, \$499; nickel cadmium battery pack, \$129; carrying case, \$89.

In Short: The UltraLite SL/20P has less writing space than a tablet or slate, but won't sacrifice computing power. A full-featured portable pen computing platform, the SL/20P offers the best of both pen-centric and notebook worlds.

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MICROSLATE'S RUGGED PEN PC

PREVIEW

by Emerson Torgan

It's not slim, light, or well-rounded at the corners, but there aren't many pen PCs that you can confidently toss in the back of a Jeep and take off on a bumpy ride.

MicroSlate's Datellite 400L is the first pen-based PC to feature Cyrix's Cx486SLC/20 processor. Its bright, backlit 9.5-inch "Pen N' Touch" screen lets you use a plastic-tipped pen or even a finger to navigate PenPoint or Win-

dows for Pen Computing.

The rugged, 2.5-inch-thick unit weighs in at a heavy 7.5 pounds with both batteries and its rubber end caps in place (6.3 pounds with one battery and no end caps) and promises to provide hours of computing on-the-go via *Omnisuspend* interstroke power management software, which powers down subsystems during periods of inactivity.

MicroSlate custom configures the Datellite and offers a wide variety of op-

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OS/2 Performance: A Better DOS than DOS? A Better Windows than Windows?

HANDS ON
by Bill Bettini, Joe Salemi,
and Don Willmott

IBM has long maintained that once OS/2, Version 2.0, was in the hands of users, its technological advantages would make it the operating system and graphical user interface of choice. Microsoft Windows 3.1 has been winning the marketing battle since both it and OS/2 2.0 became available in early April, but does OS/2 indeed hold the high ground when it comes to technology and performance?

PC Magazine Labs ran a battery of tests to answer three questions about OS/2 2.0: Do its disk and video control and preemptive multitasking make it a better

DOS than DOS? Does its use of full protected mode make it a better Windows than Windows? And do improvements in the new version make it a better OS/2 than Version 1.3? (For a detailed description and evaluation of OS/2, see "OS/2 2.0: Does It Fulfill the Promise?" *PC Magazine*, April 28, 1992.)

A BETTER DOS THAN DOS?

We installed OS/2 2.0 on a 25-MHz 386-based Compaq Deskpro 386/25e with 16MB of RAM and a 300MB ESDI hard disk. We ran the complete PC Labs Benchmark Tests, Version 6.0, as a DOS application under

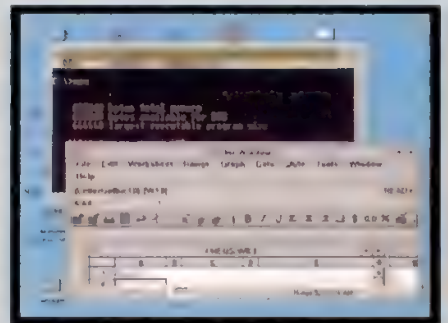
OS/2 (with its dynamic swapfile) to test OS/2 overhead, then did the same thing under Windows 3.1 (with 32-bit Fastdisk technology active and a 20MB swapfile) to test Windows' overhead.

There were no significant performance differences on the processor and memory tests

PERFORMANCE CONCLUSION

OS/2 2.0 lets you run multiple DOS applications either full-screen or windowed with sophisticated preemptive multitasking. It also lets you use up to 640K per application (by loading DOS high), and each multi-

In addition to running OS/2 applications, OS/2 2.0 can multitask Windows and DOS programs in their own screen group and on the Workplace Shell Desktop.



tasking session can have full access to upper memory blocks (UMBs), XMS, and EMS memory, all the way up to their theoretical limits. Neither DOS alone nor Windows can accomplish all of these tricks.

Tests also show a very positive impact on disk performance of DOS apps under OS/2. That, combined with video performance improvements, will make your DOS applications look and feel much faster. OS/2 is a better DOS than DOS, if you've got the hardware to run it.

However, there were big differences in the disk and video results. DOS disk operations under OS/2 2.0 were almost four times as fast as under DOS alone due to OS/2's High Performance File System and its disk cache. One important footnote to the disk tests should be noted, however. We reran the disk test for DOS 5.0 and included SMARTDrive 4.0, the disk cache that comes with Windows 3.1, rather than SMARTDrive 3.13, the disk cache that comes standard with DOS 5.0. With the improved SMARTDrive, which included a form of deferred writes called write-behind caching, DOS 5.0 improved its performance over five times, outpacing a DOS session under Windows 3.1.

On the video test, DOS under OS/2 performed 11 percent faster than DOS running standalone. That's because OS/2 writes to virtual memory space using its own efficient 32-bit memory BIOS and its drivers are more effective. Due to Windows' overhead, when we ran the benchmark test as a DOS application under Windows 3.1, its performance decreased by 3 percent.

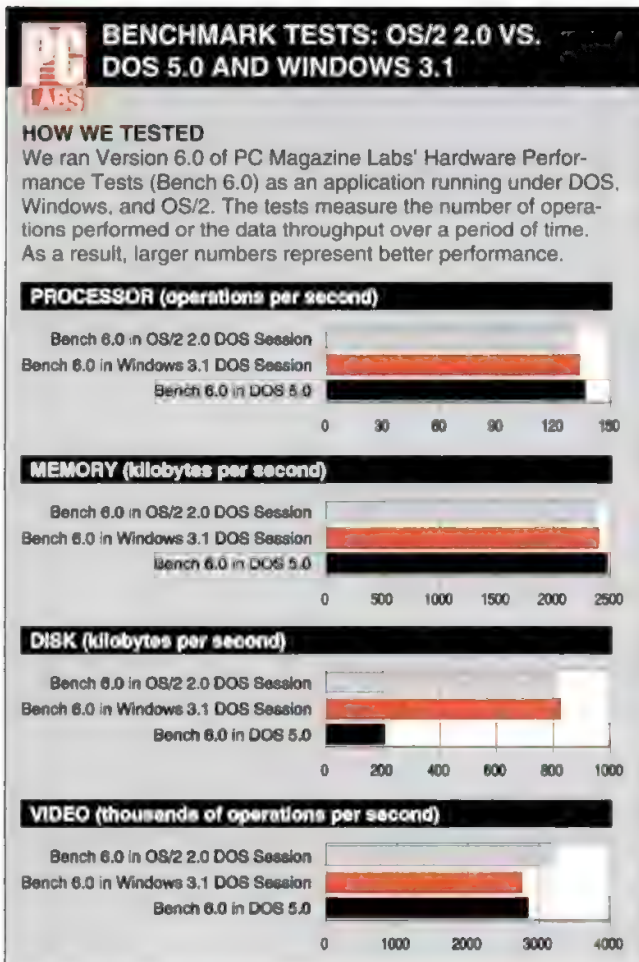
A BETTER WINDOWS THAN WINDOWS?

Both OS/2 and Windows can run multiple Windows applications. Which one does it better?

We set up OS/2 according to IBM's recommendation for use with Windows and installed OS/2's High Performance File System. OS/2 has a Windows 3.0 kernel built in rather than a 3.1 kernel, so it does prevent you from running 32-bit Windows applications (see "Running Your Apps Under OS/2"). First, we ran new Windows multitasking tests in two configurations: with OS/2's Seamless mode (Windows apps running windowed on the OS/2 desktop) and with OS/2's full-screen Windows mode (all Windows apps running in one Windows session under OS/2).

Because the test system had

CONTINUES ON PAGE 46



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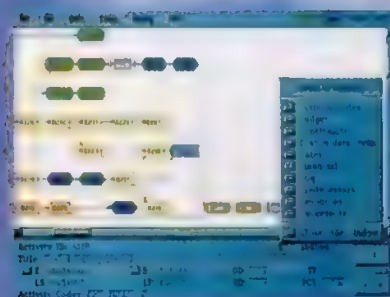
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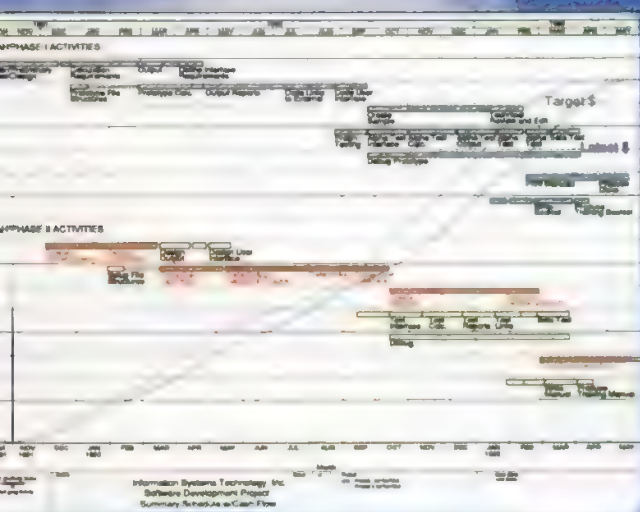
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First Looks

OS/2

CONTINUED FROM PAGE 44

16MB RAM, we were also able to run the Seamless (windowed) mode test with separate Windows sessions (each Windows app running in its own session of Windows under OS/2).

According to IBM, the best multitasking performance should occur in this configuration, with separate virtual DOS machines (VDMs) running for each Windows app. Each VDM session requires 2MB of RAM, and we chose to give each one 3 MB, so the 16MB configuration was enough for our four-application test, which multitasks *Ami Pro*, *CorelDRAW*, and *Superbase 4* serially while *Microsoft Excel* recalculates in the background.

In this scenario, Windows 3.1 was the winner, completing the test in just under 14 minutes. Windows 3.1 performance enhancements were behind that winning time.

Running the apps in one Windows session under OS/2 resulted in a time of just over 19 minutes, but running each app in

its own virtual DOS machine, the setup that IBM recommends, yielded the slowest time, 22 minutes 12 seconds. The overhead of having to load all that Windows start-up code each time is responsible for the slow showing.

Other testing showed that DOS applications running under OS/2 in full-screen mode yield better video performance than they do under Windows 3.1, again because of OS/2's efficient use of virtual memory.

The graphics Winmark result (run on 8MB test systems) showed that common graphics operations in Windows applications under OS/2 2.0's Seamless (windowed) mode slowed by 34 percent compared with Windows 3.1 performance in 386 Enhanced mode because of all that windowing overhead. When we moved Windows to full screen, performance improved, but was still only 77 percent as fast as Windows 3.1 in 386 Enhanced mode.

However, the Disk Winmark results (also run on systems with 8MB RAM) showed OS/2 coming out ahead. Hard disk operations for Windows applications running under OS/2 ran 12 percent faster than when they ran under OS/2 in Seamless mode.



BENCHMARK TESTS: OS/2 2.0 VS. WINDOWS 3.1

HOW WE TESTED

Winmark results represent the geometric mean of 11 Winbench graphics tests. PC Magazine Labs profiled the major Windows applications in November, 1991 and determined which graphics functions are most frequently used within Windows. Winmark takes into account tests of these key functions and weights them to reflect how frequently the functions are used. Here we report the graphics Winmark result and the disk Winmark result. Higher scores represent better performance.

	Graphics Winmark	Disk Winmark
Winbench in OS/2 2.0: Seamless mode (Windows 3.0 in a window)	1423584	2775591.331
Winbench in OS/2 2.0: Full-screen Windows 3.0 mode	1666155	2791008.384
Winbench in Windows 3.1 Enhanced mode	2155229	2470561.205

Hard disk performance in OS/2's full-screen Windows 3.0 mode was 13 percent faster than Windows 3.1 performance. OS/2's High Performance File System was clearly helping in these two cases.

PERFORMANCE CONCLUSION

Though disk performance for Windows applications is better under OS/2 than under Windows 3.1, video performance is not. OS/2's built-in Windows kernel is based on Version 3.0, not 3.1, so Windows applications should

perform better under Windows than under OS/2.

Today, video drivers are better for Windows 3.1 than for OS/2, and a number of video board manufacturers are offering Windows accelerator boards designed specifically to speed up Windows. Once video board manufacturers get OS/2-specific drivers out to users, this advantage may diminish, but today, Windows holds a clear video advantage.

For now, OS/2 isn't a better Windows than Windows, but with its full protected mode giving it the ability to prevent one bad application from bringing down the whole system, OS/2 could be called a potentially safer Windows than Windows.

RUNNING YOUR APPS UNDER OS/2

by Carol Levin

Anyone pondering a move to OS/2 will focus on one important question: How will my DOS and Windows apps behave? OS/2 2.0 went through rigorous beta testing, and IBM's compatibility lab tested OS/2 with hundreds of applications. So far, the news is mostly good. IBM has identified just seven specific situations that give OS/2 2.0 a hard time and has found 20 incompatible programs.

SEE HOW IT RUNS WINDOWS APPS

How will OS/2 run your Windows applications? IBM has reported that OS/2 is unable to run Windows 386 Enhanced mode programs that require the dynamic link library

WINMEM32.DLL, which gives Windows the ability to run true 32-bit Windows programs.

As for DOS applications, OS/2 2.0 lacks support for DOS programs that use the VCPI (virtual control program interface) memory management protocol, but it does support programs that use the newer DPMI (DOS protected-mode interface) as well as Windows 386 Enhanced mode apps that comply with DPMI.

Programs that directly address physical disk sectors pose a threat to OS/2's file system, and DOS communications programs that need more than 1,000 interrupts per second are not guaranteed to work. DOS debuggers are also problematic.

INCOMPATIBILITIES

The best known of the incompatible programs that IBM has identified include *Central Point Backup for Windows*, *CloseUp*, *DoDot 3.0*, *Mathematica*, *OmniPage Professional*, *Oracle for DOS*, *Realizer*, and *Smart Fax*. IBM has included an "Application Considerations" section in OS/2's on-line documentation that lists incompatible programs and details the adjustments you'll have to make to run certain programs (click on the Seek and Scan icon and search on "readme" to find it). IBM keeps this information updated on its National Support Center bulletin board service (404-835-6600), Prodigy, and CompuServe.

A BETTER OS/2 THAN OS/2?

Since 32-bit versions of 16-bit applications are still something of a rarity, we set out to answer this question by testing the 16-bit *Lotus 1-2-3/G* on both OS/2 1.3 and OS/2 2.0.

The results? Loading, recalculating, and saving a 180K spreadsheet took 30.2 seconds under OS/2 1.3 and 28 seconds under OS/2 2.0—an improvement, but not a stunning one.

PERFORMANCE CONCLUSION

OS/2 2.0's improved memory management and 32-bit kernel code help it to run 16-bit OS/2 applications slightly faster than OS/2 1.3. Once 32-bit versions of 16-bit OS/2 apps are more prevalent, we'll be able to measure the performance advantages of true 32-bit processing. ■

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1-800-722-5728/(619) 674-6500

Tektronix Breaks \$5,000 Barrier with Color PostScript Printer

HANDS ON
by Alfred Poor

Now that laser printers have become commonplace, the next frontier is color. The Tektronix Phaser II PXe is a milestone product that shows how quickly this frontier's boundaries are being pushed back.

The Phaser II PXe uses the same 300-dot-per-inch thermal wax transfer engine found in the Phaser II family of printers. It's also the first printer in its class to offer true Adobe PostScript Level 2 support and a list price just under \$5,000.

The printer comes with 17 PostScript font outlines—less than the standard 35 fonts that most PostScript printers use. You can add an additional 22 fonts for \$95. The printer also comes with 4MB of memory, upgradable to 8MB for an additional \$995.

The biggest news about the printer, however, is its ease of use. Setup is easy. The most difficult step is loading the ink roll in the printer, which takes a minute at most. The printer has parallel, serial, and AppleTalk ports, all of which are active simultaneously, so it's easy to share the

printer among multiple computers. The one bank of configuration switches is easy to find on the outside of the printer's back, and the switch settings are clearly marked right on the case.

The printer accepts a variety of materials and comes with sample supplies of smooth paper and transparencies. Tektronix offers three types of ink rolls: four-color with 275 prints per roll



The Phaser II PXe speeds printing with its RISC processor and PostScript Level 2.

(\$150), three-color with 342 prints per roll (\$145), and all-black rolls with 1,100 prints per roll (\$160). A sample three-color roll with 100 prints is also included.

The fourth color on the four-color roll is black, but the sample three-color roll did an excellent job of producing black simply by overlapping the cyan, ma-

genta, and yellow inks. The registration was excellent; even the fine strokes of text characters in our font test were smooth and solid black without a hint of the colored halos that would occur if the colors didn't overlap precisely. Large areas of black were glossy and solid.

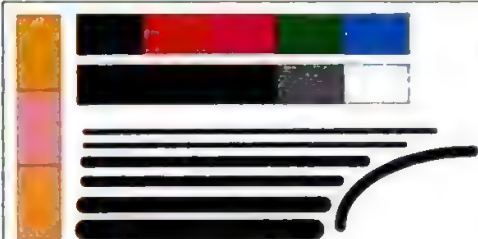
Since the printer has to make three or four passes over the page to create an image, it must be able to move the sheet of paper back and forth accurately. Like most printers in its class, the Phaser II PXe clamps the short end of the sheet, which means that it cannot print to the edge at that end. As a result, you are limited to an 8.1- by 8.8-inch image size for letter-size paper. Most users will prefer to use legal-size sheets, which can produce an 8.1- by 10.8-inch image; you can then trim the extra paper off the ends to create a letter-size image.

TWO MINUTES PER PAGE, IN COLOR

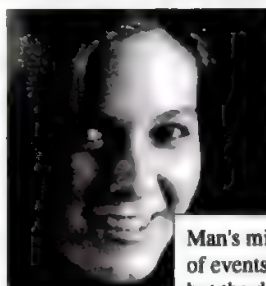
The print engine is rated at 46 seconds per page with the three-color ink roll (25 seconds for the all-black roll). The parallel interface provides rapid data transfer from the computer, and the printer's controller has a 16-MHz AMD 29000 RISC processor that helps speed through the image processing tasks.

On the PC Magazine Labs printer benchmark graphics speed test, the Phaser II PXe produced slightly less than 0.50 graphic pages per minute, taking about 2 minutes per test page. This is about the same as the color printers covered in last

year's 8th Annual Printer Issue (November 26, 1991), even though those printers all cost \$2,000 to \$5,000 more.



Tektronix uses a thermal wax transfer engine that makes three or four passes over an image to produce the color output shown here. The fine strokes of text characters are extremely smooth and solid black.



Man's mind cannot grasp the causes of events in their completeness but the desire to find the causes is implanted in man's soul. -Tolstoy
Courier Bold Underline Italic
Palatino Bold Underline Italic
Helvetica Bold Underline Italic



FACT FILE

Tektronix Phaser II PXe

Tektronix Inc., P.O. Box 1000, MS 63-583, Wilsonville, OR 97070; 800-835-6100.

List Price: \$4,995; 4MB RAM upgrade, \$995.

In Short: The Phaser II PXe makes 300-dpi color printing easy and more affordable, with true Adobe PostScript Level 2 support and a list price of just under \$5,000.

CIRCLE 425 ON READER SERVICE CARD

The printer benchmark tests don't register the additional graphics processing speed offered by Adobe PostScript Level 2, and that can explain the difference between the claimed speed and PC Labs' findings.

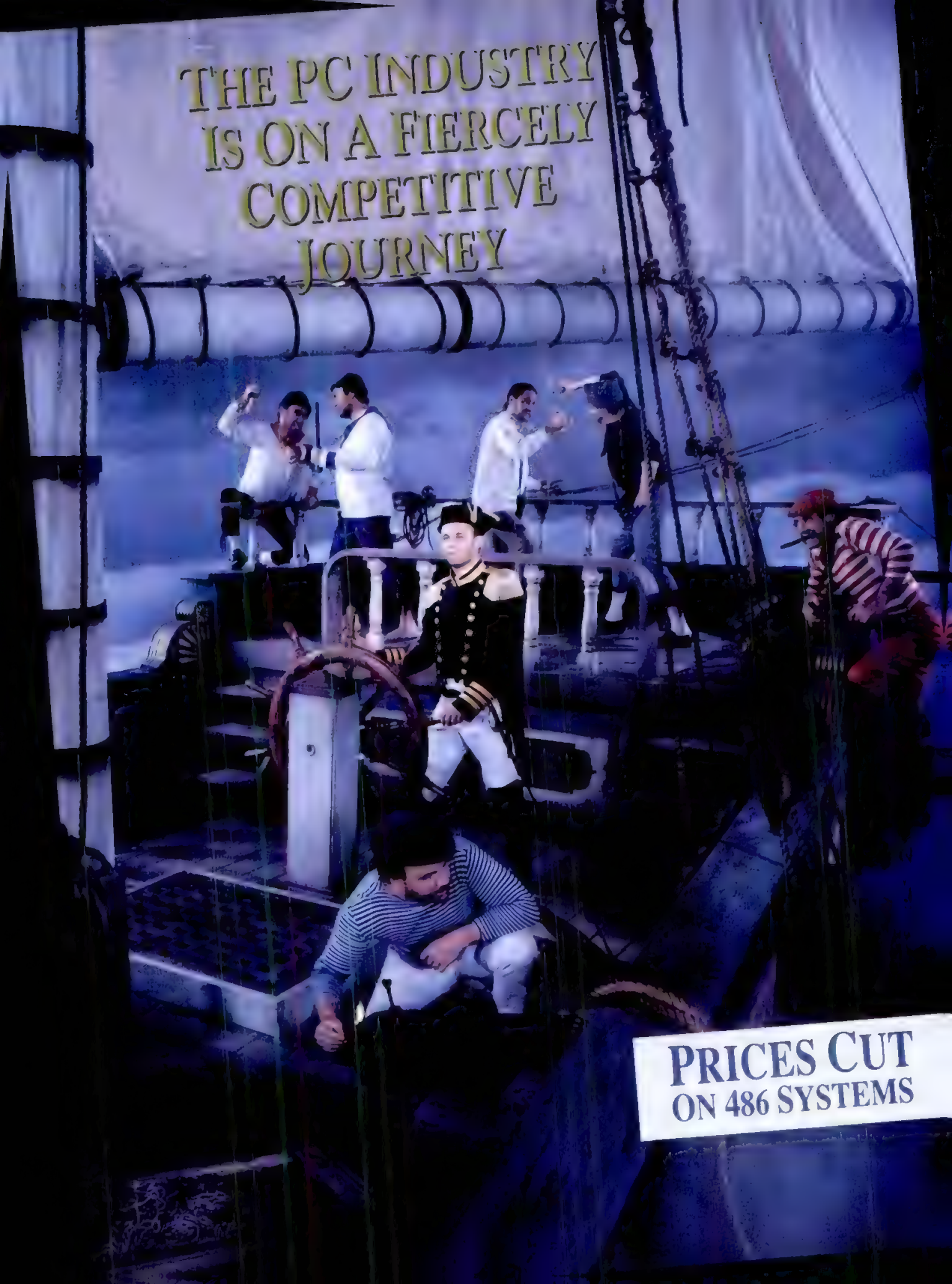
The Phaser II PXe is also capable of performing the role of a plotter, since it supports the HPGL plotter language. That means the printer should provide fast output for many charting and drafting applications.

Tektronix includes drivers for Windows 3.0 and for Lotus Freelance for DOS. These drivers take advantage of the benefits of PostScript Level 2. Many popular applications, such as Harvard Graphics and Lotus 1-2-3, Release 3.1, also contain built-in support for the Phaser II PXe and other Tektronix printers.

The printer is Pantone certified and can simulate the spot colors used in printing. There are two sample files that print color reference charts using CMYK and RGB color models and indicate the settings for each color sample.

You can get color printers with PostScript clone support for about the same price as the Phaser II PXe, but Adobe PostScript Level 2 offers speed advantages that make this a better buy. And you can get other printers that are as fast or faster and offer Adobe PostScript, but they cost \$2,000 to \$10,000 more.

Clearly, the Phaser II PXe has broken new ground in the color page printer market. At least for the moment, it offers an unbeatable combination of price and performance.

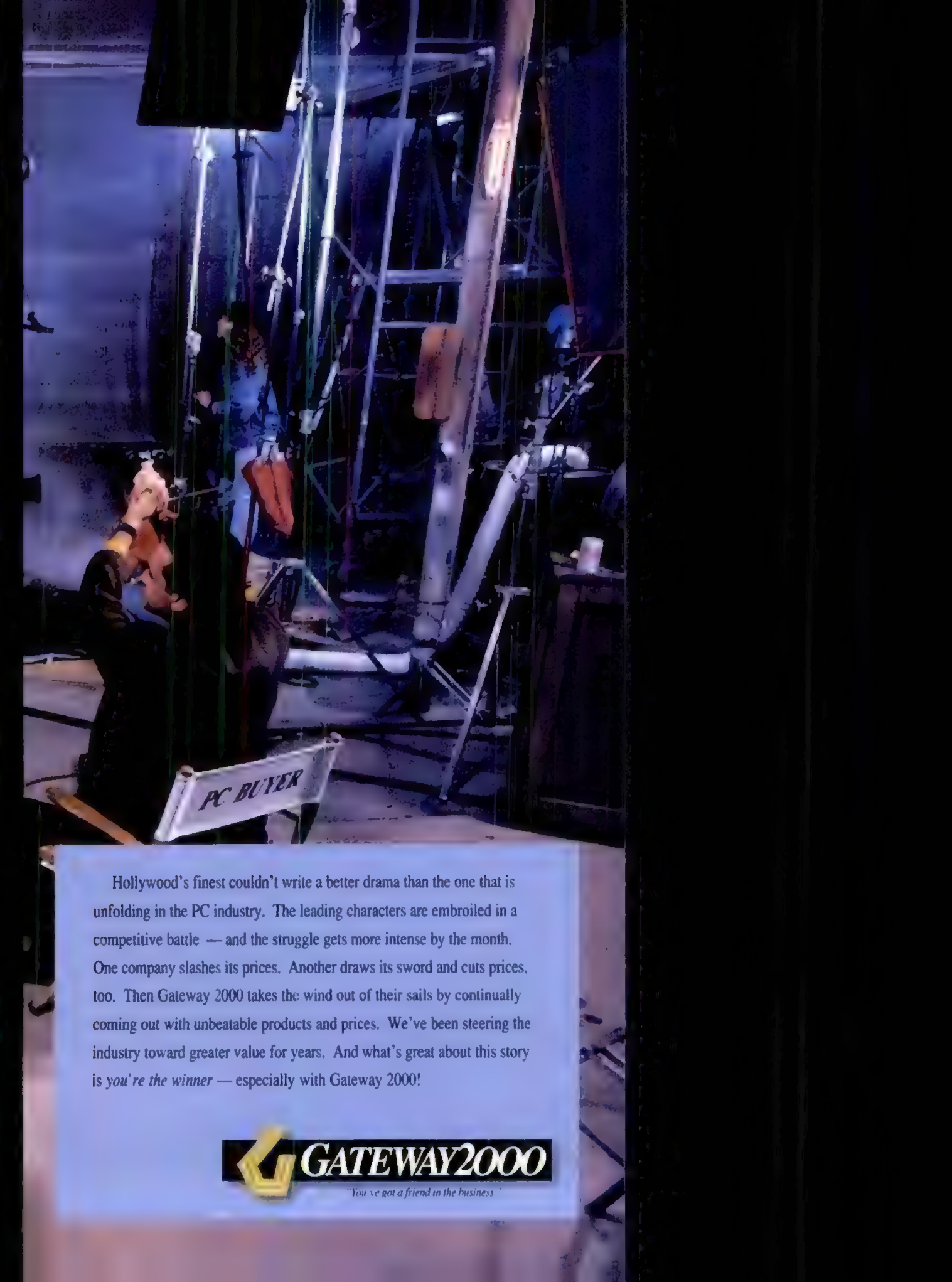


THE PC INDUSTRY IS ON A FIERCELY COMPETITIVE JOURNEY

**PRICES CUT
ON 486 SYSTEMS**

ISN'T IT GREAT?



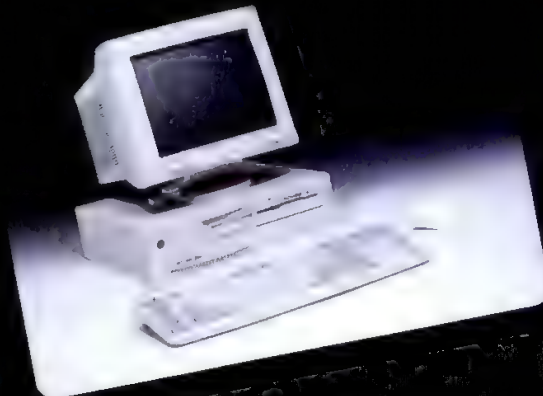


PC BUYER

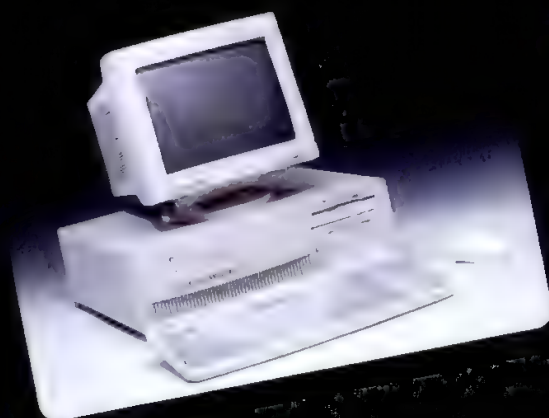
Hollywood's finest couldn't write a better drama than the one that is unfolding in the PC industry. The leading characters are embroiled in a competitive battle — and the struggle gets more intense by the month. One company slashes its prices. Another draws its sword and cuts prices, too. Then Gateway 2000 takes the wind out of their sails by continually coming out with unbeatable products and prices. We've been steering the industry toward greater value for years. And what's great about this story is *you're the winner* — especially with Gateway 2000!



"You've got a friend in the business"



NEW
386SX/25



Everyday 386's are
386SX/25's are a
compact, powerful
system. A more powerful
system is available only
from IBM. A system that
works a lot better than
any other.



HERE'S YOUR TICKET: GATEWAY 2000 386 PCs

The two systems in our 386 product cast give you the best price/performance in SX and DX categories. We introduced some new talent last month — a 25MHz 386SX. This system outperforms 16 and 20MHz 386SX machines, yet it's priced the same or better.

Our 33MHz 386DX, chosen by *Computer Shopper* readers as the Best Buy of 1991 in its category, is a box office favorite. This fully featured system offers the most value on the market for under \$2,000.

25MHz 386SX

System Highlights: 4MB RAM ■ 80MB Western Digital® IDE hard drive with 32K read-look-ahead cache buffer ■ 16-bit VGA graphics with 512K ■ 14" CrystalScan 1024 VGA color monitor, up to 1024 x 768 interlaced resolution ■ five 16-bit expansion slots available in standard configuration ■ mini desktop model ■ **\$1,595**

33MHz 386DX

System Highlights: 64K cache RAM ■ 4MB RAM ■ 120MB Western Digital IDE hard drive with 64K multi-segmented cache ■ 16-bit Diamond Speedstar Plus™ video card with 1MB ■ 14" CrystalScan 1024NI VGA color monitor, up to 1024 x 768 non-interlaced resolution ■ seven 16-bit slots on motherboard, one 32-bit memory slot and five 16-bit ISA slots available in standard configuration ■ desktop model is standard ■ ~~\$1,995~~ **\$1,795**

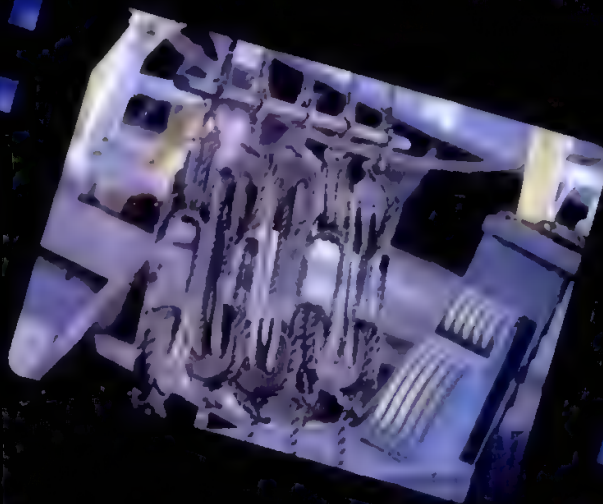
All Gateway 2000 systems come fully configured with all the features you want, including two diskette drives, a programmable 124-key AnyKey™ keyboard, a Microsoft® mouse, MS DOS® 5.0, the new Windows™ 3.1 and your choice of one application software option. See the back pages of this ad for complete configurations and information about software options, upgrades and peripherals.



Gateway 2000's new 486SX/25 comes with 4MB RAM, a 200MB IDE hard drive and the ATI Graphics Ultra video card with graphics coprocessor for only \$2,195.



NEW
486SX/25



EISA systems now come standard in a floor-standing tower model.

BLOCKBUSTERS: GATEWAY 2000 486 PCs

Making its debut some years ago, 486 technology has finally reached a price point at which it is upstaging 386 technology in value. Gateway 2000's 486 systems have always been star performers, but recent price reductions and the introduction of a 25MHz 486SX and two new DX2 systems make the Gateway 2000 486 line more appealing than ever.

25MHz 486SX

Besides being faster than any 386 machine on the market, the 486SX/25 is upgradeable to a 486DX2/50 if you need increased performance in the future.

System Highlights: 4MB RAM ■ 200MB Western Digital® IDE hard drive ■ ATI™ Graphics Ultra ■ 14" CrystalScan 1024NI VGA color monitor, up to 1024 x 768 non-interlaced resolution ■ desktop model is standard ■ ~~\$2,395~~ **\$2,195**

33MHz 486DX

The 486DX/33, our best-selling system until the DX2s came along, is still an excellent machine, especially with ATI video. Plus, it's upgradeable to a 66MHz DX2 when this CPU is introduced.

System Highlights: 64K cache RAM ■ 4MB RAM ■ 200MB Western Digital IDE hard drive ■ ATI Graphics Ultra ■ 14" CrystalScan 1024NI VGA color monitor, up to 1024 x 768 non-interlaced resolution ■ desktop model is standard ■ ~~\$2,795~~ **\$2,495**

50MHz 486DX2

This is without a doubt the fastest system at the most incredible price on the market today. The combination of a DX2 dual speed processor, an ATI Graphics Ultra video card and a fast IDE drive, made faster with RIDE BIOS, makes this machine worthy of an Academy Award. Our benchmarks show a 35% increase in performance over a 33MHz 486DX. Coretest benchmarks show large block disk-to-memory operations are over 30% faster with RIDE.

System Highlights: 64K cache RAM ■ 8MB RAM ■ 200MB Western Digital IDE hard drive with RIDE BIOS ■ ATI Graphics Ultra ■ 14" CrystalScan 1024NI VGA color monitor, up to 1024 x 768 non-interlaced resolution ■ desktop model is standard ■ ~~\$2,995~~ **\$2,795**

EISA SYSTEMS — 33MHz 486DX & 50MHz 486DX2

The 33MHz system is upgradeable to a 66MHz DX2 later this year.

System Highlights: 128K cache RAM ■ 8MB RAM ■ 340MB Maxtor® SCSI hard drive ■ 32-bit EISA SCSI controller ■ Diamond Speedstar Plus™ 16-bit VGA graphics ■ 14" CrystalScan 1024NI VGA color monitor, up to 1024 x 768 non-interlaced resolution ■ floor-standing tower model is standard ■ 486DX/33 EISA is **\$3,795** ■ 486DX2/50 EISA is ~~\$3,995~~ **\$3,895**

BLOCKBUSTERS
486 SYSTEMS



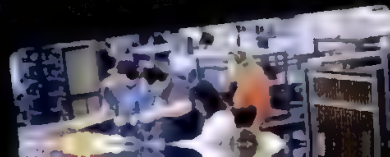
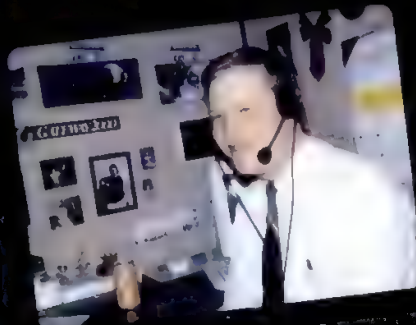
Personal service is the guiding force at Gateway 2000.

Knowledgeable, friendly people answer your call and welcome your questions.

We're happy to share information on systems and peripherals to meet both your present and future needs.

We'll help you custom-design the system best suited to your personal requirements.

Your order receives our immediate attention.



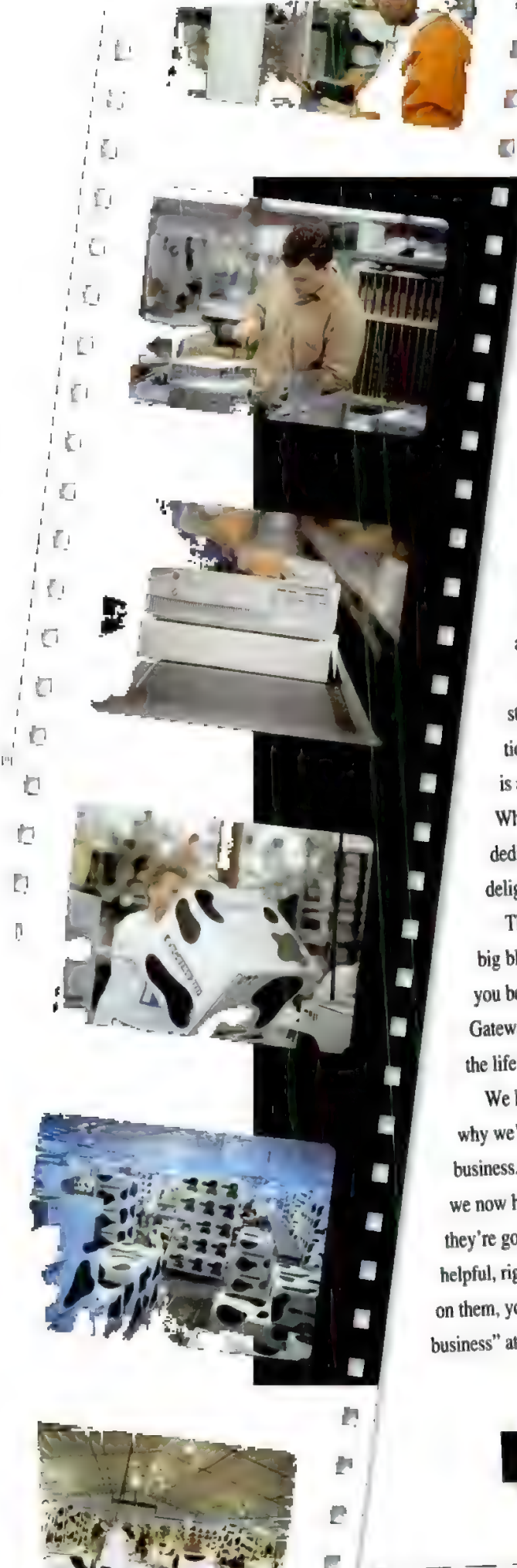
Your system is carefully assembled according to your configuration.

Plus, you can be assured that your system is built with all the pride of a conscientious work ethic that is ...

...alive and well in North Sioux City, South Dakota.

After rigorous and thorough quality and performance checks,

...your system is packed to insure that it reaches you in perfect working order.



OUR CREW TREATS YOU LIKE A STAR

Even though Gateway 2000 is now the largest direct market PC manufacturer in the U. S., we continue to do business the way we always have — with an emphasis on old-fashioned, personal service. In the epic adventure of buying a computer, you're the star at Gateway 2000.

In our company mission statement, one of our stated objectives is to exceed customer expectations in quality, service and value. This objective is a personal challenge to each of us at Gateway. When you become a customer, you have over 1,400 dedicated people striving to make sure you're delighted with your Gateway 2000 purchase.

This commitment extends far beyond the day those big black-and-white cow-spotted boxes arrive. When you become a Gateway customer, you're part of the Gateway family and you get free technical support for the life of your machine.

We know how important service is to you, which is why we're constantly striving to provide the best in the business. If you have a question or something goes wrong, we now have over 200 people on-line to help you. And they're good people — experienced and patient, friendly and helpful, rigorously trained and tested. If you ever need to call on them, you'll know why we say "you've got a friend in the business" at Gateway 2000.

 **GATEWAY2000**
"You've got a friend in the business."

BEHIND THE SCENES
PERSONAL SERVICE

GOODIES TO GO

Free Application Software Options

When you purchase any Gateway 2000 computer system, you choose one application software option at no additional cost.

We'll install your software on your hard drive, optimally configured for your system and Windows, and provide master diskettes and manuals. Additional software packages are also available at extremely competitive prices. Ask your Gateway sales person for complete details. Choose from the following application software options:

Option #1 — Microsoft Excel for Windows™ 4.0

- New version of this powerful spreadsheet
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Option #2 — Microsoft Word for Windows™ 2.0

- Best-selling word processor for Windows
- New version 2.0 adds spectacular refinements
- Includes online help for WordPerfect® users

Option #3 — Microsoft PowerPoint for Windows™ 2.0

- Easy-to-use desktop presentations
- Creates high-quality overheads and 35mm slides

Option #4 — Borland® Paradox® 3.5

Option #5 — The Entrepreneur Pack includes the latest Windows versions of:

Sorry —
we sell
peripherals
only with the
purchase of a
Gateway 2000
system, or to
people who
are already
Gateway 2000
customers.

Microsoft's Windows 3.1 is now standard with all Gateway 2000 systems. Windows 3.1 includes many new features and enhancements you'll enjoy:

- Fewer UAEs
- Improved performance
- Built-in multimedia capabilities
- Better network support
- Includes four True Type font families

This offer includes the identical applications contained in retail packages but will not include the retail box.

You get all master diskettes and manuals, shrink-wrapped and packaged in a Gateway 2000 box.

WITH YOUR GATEWAY 2000 PC

- **Microsoft Works™** integrating word processing, spreadsheet, and database in one easy-to-use program

- **Microsoft Publisher™** for creating page layouts

- **Microsoft Money™** to help you write checks, set budgets, track expenses

- **PLUS an Entertainment Pack** with eight games including Tetris®

Option #6 — The Windows Programmer Pack, includes everything you need to create programs for Windows: *Microsoft QuickC for Windows™*, *Visual Basic for Windows™*, *Windows Control Development Kit™*, *Windows Help Compiler™* and *Windows Programmers' Online Reference™*.

Option #7 — Microsoft Project for Windows™ 3.0

- Flexible and easy project management program

- Includes interactive online tutorial

Peripherals

The ATI Graphics Ultra

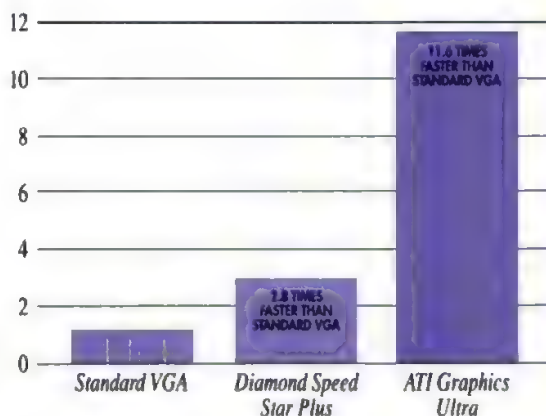
ATI achieves a quantum leap in performance with its coprocessor-equipped video card. The ATI Graphics Ultra is the fastest video card available in its class — up to 10 times faster than standard VGA. The Ultra supports resolutions up to 1280 x 1024. And because it is compatible with many common graphics standards, the Graphics Ultra makes applications easy to install using standard video drivers provided with the software.

The ATI Graphics Ultra video card is standard with all 486 ISA systems. It's an upgrade option with the purchase of a 386DX or a 486 EISA system for an additional \$100.

The Gateway 2000 TelePath™ Fax/Modem

The Gateway 2000 TelePath may set a new box office sales record for us. It's no wonder. For only \$195, you get the Gateway 2000 TelePath — a 14,400 bps modem, V.32bis, with 9,600 bps fax capability plus WinFax Pro™, Crosstalk® for Windows, Qmodem® and a free 30-day basic

ATI Graphics Ultra Performance Comparison



Figures computed on a 486DX/33 and provided by ATI Technologies Inc.

services CompuServe® membership.

- Fax mode: V.17, V.29, and V.27ter

- Data mode: V.32bis, V.32, V.22bis, V.22, V.21, Bell 212A and 103, V.42 and MNP 2-4 error correction, V.42bis/MNP 5 data compression

The 15-Inch CrystalScan 1572FS

The new 15-inch CrystalScan color monitor has a flat, square, non-glare screen, reducing distortion around the corners and providing edge-to-edge display area. The refresh rate is higher, 72Hz, for added image stability and flicker-free display. The non-interlaced CrystalScan 1572FS will support resolutions up to 1280 x 1024. Plus, we've moved the fine tuning controls to the front of the monitor for easy access. The CrystalScan 1572FS is available only with the purchase of a 386DX or 486 system for an additional \$195. (Availability is limited.)



GATEWAY 2000 BOX OFFICE HITS

NOMAD 325SXL

- 25MHz, 386SXL Processor
- 2MB RAM
- 1.44MB 3.5" Drive
- 80MB Hard Drive
- Backlit 10" VGA Screen, 64 Grays
- Size 8.5" x 11" x 1.8", 5.8 lbs.
- 7 Hr.* NiCad
- Battery & Charger
- 1 Parallel/1 Serial Port
- 79-Key Keyboard
- Pointing Device
- MS DOS 5.0 & Windows™ 3.1

\$1995

NOMAD 420SXL

- 20MHz, Intel® 486SX Processor
- 4MB RAM
- 1.44MB 3.5" Drive
- 80MB Hard Drive
- Backlit 10" VGA Screen, 64 Grays
- Simultaneous Video with 1MB
- Size 8.5" x 11" x 1.8", 5.8 lbs.
- 6 Hr.* NiCad
- Battery & Charger
- 1 Parallel/1 Serial Port
- 79-Key Keyboard
- Pointing Device
- MS DOS 5.0 and Windows 3.1

\$2795

NOMAD 425DXL

- 25MHz, Intel 486DX Processor
- 4MB RAM
- 1.44MB 3.5" Drive
- 120MB Hard Drive
- Backlit 10" VGA Screen, 64 Grays
- Simultaneous Video with 1MB
- Size 8.5" x 11" x 1.8", 5.8 lbs.
- 6 Hr.* NiCad
- Battery & Charger
- 1 Parallel/1 Serial Port
- 79-Key Keyboard
- Pointing Device
- MS DOS 5.0 and Windows 3.1

\$3495

25MHz: 386SX

- Intel 386SX Processor
- 4MB RAM
- 1.2MB & 1.44MB Drives
- 80MB 17ms IDE Cache Drive
- 16-Bit VGA with 512K
- 14" CrystalScan 1024
- Color VGA Monitor
- 1 Parallel/2 Serial Ports
- 124-Key AnyKey™ Keyboard
- Microsoft® Mouse
- MS DOS 5.0 and Windows 3.1
- Choice of Application Software

\$1595

33MHz: 386DX

- Intel 386DX Processor
- 64K Cache RAM
- 4MB RAM
- 1.2MB & 1.44MB Drives
- 120MB 15ms IDE Cache Drive
- 16-Bit VGA with 1MB
- 14" CrystalScan 1024NI
- Color VGA Monitor
- 1 Parallel/2 Serial Ports
- 124-Key AnyKey Keyboard
- Microsoft Mouse
- MS DOS 5.0 and Windows 3.1
- Choice of Application Software

\$1795

25MHz: 486SX

- Intel 486SX Processor
- 4MB RAM
- 1.2MB & 1.44MB Drives
- 200MB 15ms IDE Cache Drive
- ATI™ Graphics Ultra Video
- 14" CrystalScan 1024NI
- Color VGA Monitor
- 1 Parallel/2 Serial Ports
- 124-Key AnyKey Keyboard
- Microsoft Mouse
- MS DOS 5.0 and Windows 3.1
- Choice of Application Software

\$2195

33MHz: 486DX

- Intel 486DX Processor
- 64K Cache RAM
- 4MB RAM
- 1.2MB & 1.44MB Drives
- 200MB 15ms IDE Cache Drive
- ATI Graphics Ultra Video
- 14" CrystalScan 1024NI
- Color VGA Monitor
- 1 Parallel/2 Serial Ports
- 124-Key AnyKey Keyboard
- Microsoft Mouse
- MS DOS 5.0 and Windows 3.1
- Choice of Application Software

\$2495

50MHz: 486DX2

- Intel 486DX2 Processor
- 64K Cache RAM
- 8MB RAM
- 1.2MB & 1.44MB Drives
- 200MB 15ms IDE* Cache Drive
- ATI Graphics Ultra Video
- 14" CrystalScan 1024NI
- Color VGA Monitor
- 1 Parallel/2 Serial Ports
- 124-Key AnyKey Keyboard
- Microsoft Mouse
- MS DOS 5.0 and Windows 3.1
- Choice of Application Software

\$2795

*Enhanced IDE with RIDE (Rapid Integrated Drive Electronics)

50MHz: 486DX2 EISA

- Intel 486DX2 Processor
- 128K Cache RAM
- 8MB RAM
- 1.2MB & 1.44MB Drives
- 340MB 15ms SCSI Cache Drive
- 32-Bit EISA SCSI Controller
- 16-Bit VGA with 1MB
- 14" CrystalScan 1024NI
- Color VGA Monitor
- 1 Parallel/2 Serial Ports
- 124-Key AnyKey Keyboard
- Microsoft Mouse
- MS DOS 5.0 and Windows 3.1
- Choice of Application Software
- Tower Model is Standard

\$3895

OTHER SYSTEMS

■ Standard configurations also include: 16MHz 386SX, 20MHz 386SX, 25MHz 386DX, 33MHz 486DX EISA. Call for details and pricing.

* Battery life was measured using PC Magazine's Battery Rundown Test with power management enabled. Actual results may vary depending on configuration and applications.

All prices and configurations are subject to change without notice. Prices do not include shipping. Components, peripherals and software are sold only with the purchase of a system, or to customers who already own Gateway 2000 systems. Some limitations apply.



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CA-Cricket Image Gets Graphics Files into Shape

HANDS ON!
by Barry Simon

Advances in graphics technology have given PCs the ability to display photographic-quality images and handed users the processing and editing tools needed to enhance these images.

Users with serious image manipulation needs will want to take a close look at Computer Associates' *CA-Cricket Image*, a \$295 Windows-based image processor that converts and manipulates images.

A descendant of the DOS-based *PHIPS* (which we named one of the best products of 1990), *Cricket Image*, like its nearest competitor, *ImagePrep*, enhances images and adds special effects. It's best used as an adjunct to an image editor, which provides cut-and-paste tools and other techniques for manipulating images.

Cricket Image does not offer the bit-level editing features of *Picture Publisher* or *PhotoFinish* and lacks the selection tools of a typical image editor. You can process only entire images or a rectangular patch within the image.

In some ways, though, *Cricket Image* goes beyond what you'll find in editing programs. It provides file conversion, color separation and reduction, and global image manipulation tools. You can flip, rotate, and resize images and apply filters to transform an entire image. There are five sharpen and smooth filters, two noise reduction filters, and ten special effects. One impressive technique, especially when applied to gray-scale images, is oil painting.

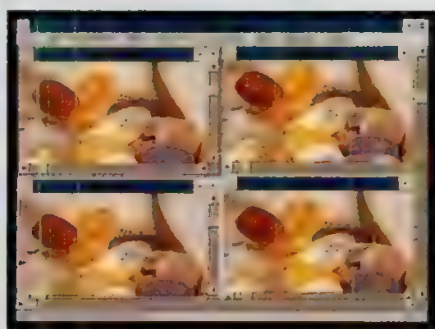
You can also remap colors by adjusting color response curves. For example, to darken the mid-range of grays, grab the curve at its midpoint and pull it up. The software can also reduce colors either to optimized palettes or to a specified number of shades of each primary color to create a "posterized" effect.

JPEG COMPRESSION

Cricket Image handles up to 24-bit color and 256 shades of gray, and it loads and saves files in plenty of formats: .BPS, .CVP, .GIF, .PCX, .PIX, .TGA, TIFF, and .WIN. Noteworthy are .CVP, the new Kodak photo format,

and JPEG, a glossy conversion format that can produce dramatic compression ratios (see "Something Lost, Something Gained: Image Compression for PC Graphics," April 28, 1992). You can convert files to different formats using a Save As option rather than a formal conversion routine.

We tested the program's compression abilities on a 500K 16-bit .TGA file (about 400K with the simple compression built into the .TGA specification). Using JPEG compression, we shrank



CA-Cricket Image squeezes this 500K 16-bit .TGA image through three JPEG compressions: 90K, 45K, and 17K.

the file to 90K with no noticeable loss of picture quality, to 45K without much loss, and to 17K with still-acceptable results.

Cricket Image is able to load multiple images and make duplicates. It also implements Windows' multiple document interface (MDI) to display thumbnails of images.

Image redrawing is slow, but this is partially offset, since the program pauses a redraw when you pull down a menu item and continues in the background while you work with dialog boxes.

If you work with large graphics files and need JPEG compression or a good selection of image filters, *Cricket Image* is hard to pass up.

List Price: *CA-Cricket Image*, Version 1.0, \$295. **Requires:** 2MB RAM, Microsoft Windows 3.0 or later. Computer Associates International Inc., One Computer Associates Plaza, Islandia, NY 11788; 800-225-5224, 516-342-5224.

CIRCLE 403 ON READER SERVICE CARD

Support On Site: CD-ROM-Based Tech Help Puts Answers on Your Desktop

HANDS ON!
by Joe Salemi

Support On Site for Applications, a CD-ROM series from Computer Library (a division of Ziff Communications, the parent company of *PC Magazine*), gives an organization's PC support department or central help desk a great reason to buy a CD-ROM drive.

A \$1,295 annual subscription to *SOS* delivers monthly updated CD-ROM disks that contain the full text of user manuals as well as detailed technical notes for 20 of the most popular PC applications. The CD also includes the text of most of the Cobb Group's application newsletters. The April 1992 disk contains manuals and tech notes for *WordPerfect* (DOS and Windows versions), *PageMaker*, Lotus's entire line of user applications (except *Notes*), Microsoft's products (including DOS and Windows versions), and most of Borland's applications.

Tech notes are also included for Quarterdeck's *QEMM* and *DESQview*. Future releases will add information for Windows 3.1 and programs from Symantec/Peter Norton, Computer Associates, Central Point Software, Fox Software, and Hayes Microcomputer Products.

PROXIMITY SEARCHES

The heart of *SOS* is the text-based *Bluefish Searchware*, developed by and licensed from Lotus. *Bluefish* lets you search the entire disk—over 67,000 documents—by keyword. Queries support a number of Boolean operators and wildcards and even allow proximity searches, which search for two words that are within a certain number of sentences or paragraphs from each other. You can then browse the individual items that a search turns up and print them or copy them to a disk file.

Searches, even on the entire disk, are pretty quick. On a 350-millisecond CD-ROM drive at-

tached to a 486/33 system, it took the program about 30 seconds to search the entire CD for the words "Windows and printers" and find 997 documents.

The best part of the CD may be the files and drivers from different vendors. The April disk includes utilities from Borland to fix damaged *dBASE* files and the latest printer drivers for *Word Perfect 5.1* and *Lotus 1-2-3*, Release 2.x.

The subscription price for *Support On Site* may be too steep for individual PC users, but for business use, the cost can easily be justified because you've saved so much time by having all this information in one easy-to-search place. *SOS* is the support tool that help desks have been waiting for.

List Price: *Support On Site for Applications*. For 12-month single-user subscription, \$1,295; for network use, \$4,995. **Requires:** 640K RAM, DOS 3.1 or later, CD-ROM drive with Microsoft CD-ROM Extensions 2.0 or later, or other High Sierra drivers. Computer Library, One Park Ave., New York, NY 10016; 800-827-7889, 212-503-4400.

CIRCLE 404 ON READER SERVICE CARD

Fast Windows Printing: FaceLift 2.0 Gives ATM A Run for Its Money

by Edward Mendelson

Bitstream wants you to think of Version 2.0 of its \$99 *Bitstream FaceLift for Microsoft Windows* as a better *Adobe Type Manager* than *ATM* itself. The new *FaceLift* creates Windows screen and printer fonts on the fly from PostScript

multiple symbol sets to Speedo fonts so you can print accented characters and other symbols otherwise unavailable under Windows.

FaceLift produces excellent printer output from Bitstream and Adobe Type 1 fonts, although *ATM* often does slightly better. Compared with both *FaceLift*'s



FaceLift's control panel can display the advanced options shown here or a set of basic options. The shadowed font was created with the Fills 'n' Shadows option.

Type 1 typeface outlines, but does it faster than *ATM* and has customization features that *ATM* can't offer. Yet with all of *FaceLift*'s advantages, you may still prefer *ATM* for its simplicity and output quality.

FaceLift scales fonts from typeface outlines in both Type 1 format or Bitstream's proprietary Speedo format, and you can mix both formats on the same page. *ATM* works only with Type 1, and earlier versions of *FaceLift* used only Speedo. *FaceLift* comes with 16 typefaces, each in both formats—four weights of Dutch and Swiss, three display faces, a monospace face, and three symbol fonts. Bitstream's separately available typeface packages now include Speedo, Type 1, and Windows 3.1 TrueType versions of each face; some also have the older Fontware format.

Bitstream officially recommends Speedo, but it's commonly known that *FaceLift* gives better printed output with Type 1. The main advantage of Speedo is that it includes 550 characters in each font. *FaceLift* lets you assign

and *ATM*'s Type 1 output, the same Bitstream designs in TrueType format tend to produce even better output at small sizes, but *ATM*'s Type 1 is equal or better at larger sizes. On-screen *ATM* is clearly superior to *FaceLift*, with smoother curves and fewer of the "dropouts" that can cause broken lines.

If you install a font into *FaceLift* in both Type 1 and Speedo formats, the program uses Speedo and ignores Type 1 except when printing in large sizes to a PostScript printer. If you install only a Type 1 outline from Bitstream or any other vendor, *FaceLift* uses it the same way it normally uses the Speedo outline except you can't use alternate symbol sets. Oddly, with Speedo fonts, the apostrophe is the same vertical stroke you get with all other Windows font technologies, but with Type 1 fonts, *FaceLift* gives you a curly apostrophe.

FASTER OUTPUT

Like Windows 3.1's native TrueType technology, *FaceLift* sends fonts to HP LaserJets as down-

loadable bitmapped PCL 4 soft fonts. This method generates a graphical image of all the characters in a font only once, and results in much faster output than *ATM* and the earlier *FaceLift for Windows*, which downloaded individual graphical images of every character in the file.

Even when printing to a PostScript printer, *FaceLift* works faster than *ATM* because *FaceLift* converts its Speedo outlines into PostScript's simple Type 3 format for each point size required. If you have matching Speedo and Type 1 fonts, *FaceLift* downloads the Type 1 outline only at sizes above approximately 28 points (the exact size varies with the typeface), when it becomes more efficient to use the Type 1 outline instead of creating a Type 3 font.

With both Speedo and Type 1 formats, *FaceLift* lets you customize fonts with shadows and fill patterns. It stores these as entries in the *FACELIFT.INI* file with codes specifying the basic font name and the altered features. These modified fonts are invariably clumsy at all sizes and unreadable below 24 points.

You can create typeface groups that let you switch between different sets of fonts for different kinds of work. Unfortunately, you can't transfer customized fonts or fonts with special symbol sets from one set to another.

AS FAST AS TRUETYPE?

FaceLift lets you print with Type 1 fonts at virtually the same breakneck speed that you can print with Windows 3.1's native TrueType.

We tested *FaceLift* on a 33-MHz 486 system, with an HP LaserJet III and a 15-page *Word for Windows* file. With Type 1 soft fonts, *Word* output the file to the Windows Print Manager in 14 seconds; the first page printed in 38 seconds; and the full document took 2 minutes 19 seconds. With TrueType, the file reached Print Manager in 11 seconds; the first page printed in 37 seconds; and



FACT FILE

Bitstream FaceLift for Microsoft Windows, Version 2.0

Bitstream Inc., 215 First St., Cambridge, MA 02142; 800-522-3668, 617-497-6222.
List Price: \$99; upgrade \$39.
Requires: 2MB RAM (4MB recommended), 3MB hard disk space, Microsoft Windows 3.0 or later.

In Short: The fastest way to print from Windows with Type 1 scalable fonts, with support for Bitstream's Speedo format, alternate character sets, or custom fills and shadows. Screen fonts don't equal those of *ATM*.

CIRCLE 426 ON READER SERVICE CARD

FaceLift has other rough edges, such as occasional lockups when reformatting *Word for Windows* files to use a *FaceLift* font, and a menu design that sometimes makes you click on OK when double-clicking should be enough. On my system, the combination of *FaceLift* and LaserMaster's Win-Jet printer driver twice trashed the hard disk.

Despite these flaws, *FaceLift* lets you print Type 1 fonts faster than any other font software, and its unique alternate symbol sets make it indispensable for international uses. If you value speed and flexibility, you won't want to print without it. ■

the whole file took 2 minutes 16 seconds.

In contrast, with *ATM*, *Word* took 38 seconds to send the file to Print Manager, 62 seconds to print the first page, and 4 minutes 15 seconds to print the file.

With a PostScript printer, both *FaceLift* with Speedo fonts and *ATM* with Type 1 fonts took 11 seconds to output to Print Manager, but *FaceLift* printed the first page in 72 seconds and the whole file in 2 minutes 30 seconds. *ATM* took 1 minute 40 seconds for the first page, 3 minutes 50 seconds for the file.—EM

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CIRCLE 287 ON READER SERVICE CARD

First Looks

Ready, Aim, FILE!: Manage Your Files with a Windows Cabinet Maker

HANDS ON
by Gregg Keizer

Even with the improvements in Windows 3.1, the quest continues for the Holy Grail of graphical file management: the tool that will make the PC a match for the Macintosh's Finder. Windows' File and Program Managers just don't cut it for many users. VSoft Development Corp.'s \$99.95

Ready, Aim, FILE! for Windows, which like its DOS predecessor applies a file cabinet metaphor to your screen, may not be the answer for everybody, but for some it's enough to call off the search.

Ready, Aim, FILE! for Windows apes the familiar office file cabinet and manila folder approach to paper management as it organizes your files. Part File

Manager replacement, part Program Manager enhancement, *Ready, Aim, FILE! for Windows* lets you collect data files and applications by content into six color-coded file "cabinets," then lets you further segregate your work into "folders" inside each cabinet. With this file utility, you can gather all the documents of a project—no matter what application created them—and launch both application and document with a single click.

Along the way, you can substitute 255-character descriptions for DOS's 8-character filenames, search through the cabinets and folders on any of 11 fields, and call up Windows accessories without returning to the Program Manager.

Although cabinet and folder setup are a snap, creating new documents or importing existing ones into a folder's file list is cumbersome, especially if you want to take advantage of *Ready, Aim, FILE! for Windows*' most flexible features. You can, for instance, create specific master files to use various templates in *Microsoft Word for Windows 2.0*, but you have to hit the utility's Setup Control screen and enter data in several data fields.

Ready, Aim, FILE! for Windows has other faults as well. Double-clicking on a file in a folder's list, for example, doesn't launch the appropriate application and open the file, as you'd expect. The File Record display, where you set up the file's long name and assign an application, appears instead. You can create floppy-based cabinets to circumvent the six-cabinet limit, but *RAF/W* forces you to use a separate index disk as a pointer to the floppy collections.

Still, *Ready, Aim, FILE! for Windows* is a possible tonic for the File Manager/Program Manager xenophobe. It's useful for beginning and midlevel users who mix DOS and Windows applications. It won't displace Symantec's *Norton Desktop for Windows* from the top sellers' charts, but it can simplify file management for those uncomfortable with the desktop.

List Price: *Ready, Aim, FILE! for Windows*, Version 1.0, \$99.95. **Requires:** 1MB RAM, 1MB hard disk space, Microsoft Windows 3.0 or later. VSoft Development Corp., 505 S. Beverly Dr., #318, Beverly Hills, CA 90212; 310-858-3941.

CIRCLE 406 ON READER SERVICE CARD



Ready, Aim, FILE! for Windows groups files created in different applications into folders you set up. Note the long filenames.

Bindview+ Keeps Tabs on Network Activity

HANDS ON
by Steve Rigney

Close control of a LAN means having the ability to generate detailed historical, customized, and long-term reports about the network. This information can help LAN managers analyze changing user requirements, disk space use (and misuse), and resource loads, and prevent potentially damaging downtime before it happens.

BindView+, Version 3.0d, is a \$395 package of powerful reporting utilities for all versions of *NetWare*. It offers comprehensive LAN documentation, security audits, disk space utilization reports, and *NetWare* usage audit and accounting reports. Though Version 3 of the LAN Support Group's program has been available for almost a year, the "d" upgrade adds more custom

reporting features and automatic report launching.

Once loaded on the file server, *BindView+* can be accessed from any networked PC, but only by a supervisor. This ensures against unwanted access to information.

BindView+ creates reports for several Data Objects. These are predefined elements of the network that you can query, including devices such as print servers, services such as print queues and user groups, and file server statistics down to the level of individual files and directories.

SECURITY CHECK

As networks begin to hold more mission-critical information, security is becoming a greater concern. A utility that tracks and audits users and their network rights is now a necessary tool.

Security auditing is *BindView+*'s most useful feature. On

a very busy network, it takes just minutes to generate a report listing user rights, passwords, and names. With *NetWare*, you would have to move through half a dozen Syscon menus and copy the information by hand to create a similar report.

To help network managers keep tabs on networks and users, *BindView+* comes with 27 predefined reports as well as over 300 fields and charts for creating custom reports. Filters can also be applied to narrow a report's scope. For example, you can define a report to list all users who own more than 5 percent of the file server's disk space, or to list users who own large files that have not been accessed in the past year.

After you compile a report on print server information, file server statistics, or group information, you can send the information to the screen, to the printer, or to Novell's MHS e-mail system—or you can save it as an ASCII, .DBF, or .WKS file.

The program's output features are very configurable, allowing you to specify DOS commands that will automatically run after you create a report or output file. For example, you can use *BindView+*'s configuration utility to create a report, save it as an ASCII file, and then launch your word processor so you can edit the report.

BindView+ is a powerful network management and reporting tool that delivers useful security and statistical reports. The ability to customize the reports makes *BindView+* a valuable addition to any *NetWare* LAN.

List Price: *BindView+*, Version 3.0d, \$395; additional server licenses, \$195. **Requires:** 520K RAM (1MB expanded or extended memory recommended); 2MB hard disk space; any version of *NetWare*. The LAN Support Group Inc., 2425 FountainView, #390, Houston, TX 77057; 800-749-8439, 713-789-0882.

CIRCLE 406 ON READER SERVICE CARD

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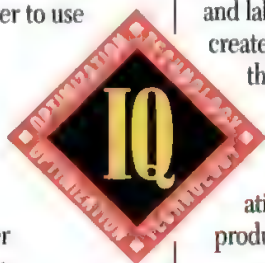
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B O R L A N D

dBASE IV from Ashton-Tate®, a Borland Company

Audio Clip Art: Prosonus's MusicBytes Livens Up Multimedia Presentations

HANDS ON
by Robert Kendall

With the arrival of multimedia support for Windows, more and more applications are including tools for adding music to presentations. But where do you get the music? That's where Prosonus comes in. Its \$149.95 *MusicBytes* library is an excellent audio equivalent of clip art.

Volume 1 of *MusicBytes* contains 27 original compositions on CD-ROM, each provided in the three audio formats supported by Windows: Red Book CD, Waveform, and MIDI. Supplementing the music is a generous assortment of sound effects in Waveform format.

Unlike most sources of music in these formats, *MusicBytes* can be used for any nonbroadcast purpose without requiring payment of royalty or license fees.

The music owes its professional quality to some of the most accomplished composers and studio musicians in the pop and film end of the business. To facilitate fitting songs to presentations, each piece comes in four different lengths—5, 15, 30, and 60 seconds.

The best sound quality comes from the clips in Red Book audio, the format used by commercial CDs. However, these selections can't be copied from the CD-ROM, so the Waveform versions will be better for some purposes.

Unfortunately, the Waveform files offer poor audio quality. Each song comes in two monaural 8-bit versions, one sampled at 22 kHz and the other at 11 kHz. The former rate results in a background hiss and tinny sound, and the 11 kHz sampling produces even lower fidelity.



MusicBytes' Media Librarian provides an easy way to find and listen to audio files on CD-ROM. It organizes music into categories, such as jazz or soft rock.

MusicBytes' Standard MIDI files provide the most disk-space-frugal option and can be edited with any sequencer. They conform to the MPC specification, following the General MIDI patch layout, and each file contains two versions of a sequence—one for a high-end synthesizer and one for the low-end FM synthesizers built into most MPC sound cards. The configuration of your Windows MIDI Mapper determines which version is played.

The high-end sequences were created for the Roland Sound Canvas and most sound superb on that unit, though it can't accurately replicate some of the live instruments used in the digitized audio versions. The low-end se-

quences pale in comparison but manage to wrest the best sound possible from FM synthesis.

The forthcoming Volume 2 of *MusicBytes* (\$249.95) will offer a larger selection of music and include 16-bit 44.1 kHz stereo Waveform files. A less expensive series called *Clip Music* is also on the way.

List Price: *MusicBytes*, Volume 1, \$149.95. **Requires:** 1MB RAM (2MB recommended), CD-ROM drive, MPC-compatible audio card, Microsoft Windows 3.1 or Windows with Multimedia Extensions. Prosonus, 11126 Weddington, North Hollywood, CA 91601; 800-999-6191, 818-766-5221.

CIRCLE 401 ON READER SERVICE CARD

Swfte's Typecase Offers 131 TrueType Fonts

HANDS ON
by Edward Mendelson

Swfte International packs more TrueType fonts into its \$99.95 *Typecase* than any other vendor fits into comparable font packages, and it manages to squeeze a unique font management utility into the bargain. The 131 fonts in *Typecase* don't approach the quality of the 44 fonts in Microsoft's \$99.95 *TrueType*

FontPack for Windows or the 40 fonts in Bitstream's \$79 *Bitstream TrueType FontPack for Windows*, but they're good enough if you want to experiment with fonts. And they're cheap enough to make the whole package worth buying just for the utility.

The *Typecase* utility lets you organize your fonts into groups called *typecases*. You can use any selection criteria when organizing fonts, and the same font

can go into more than one typecase. You can install and uninstall typecases with a few keystrokes, and the program optionally compresses font files by 30 percent when uninstalling.

The utility works best with fonts in your \WINDOWS\SYSTEM directory; it displays other fonts but won't manage them.

The menu option that lets you put new fonts on your disk works only with fonts in Swfte's compressed format, not with uncompressed fonts from other vendors. But if you try to use this menu option to reinstall fonts already on your hard disk in Swfte's compressed format, you end up with a 0-length file instead of a font. You have to edit the TYPECASE.INI file by hand and then reinstall the lost fonts from a floppy disk.

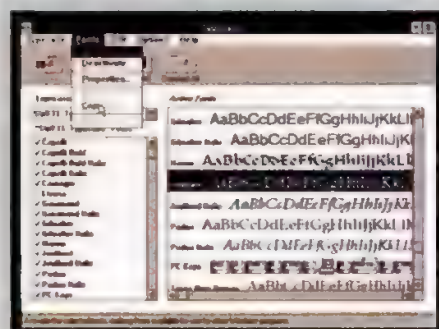
You probably won't complain about Swfte's typewriter-style and similar high-impact sans serif designs. A keycap font, with icons representing a printer, keyboard, mouse, and other hardware, works well at large sizes but looks fuzzy

at 12 points or less. If you're looking for classic designs, look elsewhere. Swfte's version of Garamond—based loosely on the overly slick ITC Garamond—is lumpy and disorienting. Swfte's weak copy of ITC Galliard (here called Jouillard) is uneven in the roman, but almost tolerable in italic. *Typecase's* pretend-Palatino (called Padua) looks coarse, and its pretend-Gill Sans (called Gibraltar) has squashed letters and irregular line widths.

Typecase and similar offerings are only the first of the low-priced megafont TrueType packages. Don't be surprised to see a superb package from Monotype soon, followed by packages from other vendors.

List Price: *Typecase*, \$99.95; competitive upgrade from Adobe, Atech, Bitstream, and Micrologix products, \$49.95. **Requires:** 1MB RAM, Microsoft Windows 3.1. Swfte International, 724 Yorklyn Rd., Hockessin, DE 19707; 800-237-9383, 302-234-1740.

CIRCLE 402 ON READER SERVICE CARD



Typecase's menu displays installed fonts and lets you transfer fonts among different typecases for installation or deinstallation as a group.

Thirteen reviewed.



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CIRCLE 026 ON READER SERVICE CARD

DigiBoard's IMAC: An Inexpensive ISDN Bridge to Distant LANs

HANDS ON
by Frank J. Dertmer, Jr.

A corollary to Murphy's Law says that the information you need is always located somewhere else. This becomes an even bigger problem as LANs proliferate and the data you need is on another network...and you're not connected.

IMAC, a \$2,195 ISDN MAC-Layer Bridge LAN link from DigiBoard, weaves two communications technologies—Ethernet and ISDN (Integrated Services Digital Network)—into a flexible inter-LAN span, giving administrators an effective and economical way to link LANs. Today's \$1,000 ISDN adapters can't compete with \$150 Ethernet cards for local links, but ISDN is practical for connections beyond a few thousand feet.

ANYWHERE IN THE WORLD

DigiBoard's IMAC has the look and feel of a modem. It is a 1.5-by 10.5-by 6.75-inch (HWD) box with Ethernet, telephone, and RS-232 connectors in back and status lights in front. In operation, it looks for Ethernet packets addressed to nodes that live on the distant LANs. When it recognizes this outbound traffic, the IMAC initiates an ISDN connection to the appropriate IMAC, which can be located anywhere in the world. It takes a few hundred milliseconds to set up an ISDN call, and you can adjust the duration of the call to suit the application.

In effect, the IMAC gives you multipoint inter-LAN connectivity on an as-needed basis. This capability is useful under IP (Internet Protocol), but requires more care under *NetWare*, which creates error messages when nodes are disconnected from a server.

The IMAC moves Ethernet packets across the ISDN line at 128 kilobits per second. In our

tests, the throughput under *NetWare* was 80 to 90 Kbps. Throughput would increase considerably using Novell's new Burst Mode Protocol, which eliminates acknowledgments and allows larger, more efficient packets.

To install the IMAC, call your

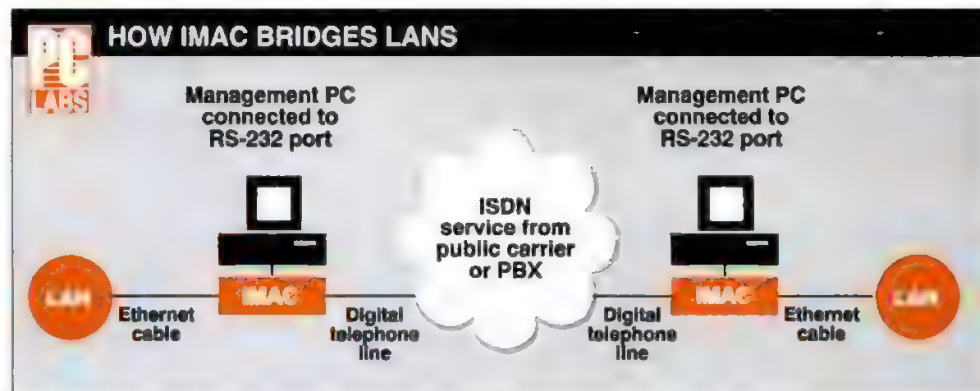
telephone company and order ISDN service, or install the IMAC behind an ISDN-compatible PBX. The IMAC works with any ISDN telephone switch and requires no advanced services, so it's easy to place the order. Then you train the IMAC to correlate packet addresses with ISDN telephone numbers by connecting a PC or terminal to the IMAC's RS-232 port and running through a simple menu-driven program contained in the IMAC's ROM and run on its 80186 processor. The program provides excellent data monitoring and management reports.

To handle heavy traffic, you can put several IMACs on the same LAN. Working in parallel, the IMACs can communicate and split the traffic load.

A unique and flexible device, DigiBoard's IMAC takes advantage of new ISDN technology to link you to distant LANs at a reasonable cost.

Price: IMAC, \$2,195. **Requires:** Ethernet network, at least one ISDN B channel (voice, 64-Kbps data, 56-Kbps data). DigiBoard, 6400 Flying Cloud Dr., Eden Prairie, MN 55344; 800-344-4273, 612-943-9020.

CIRCLE 426 ON READER SERVICE CARD



1-2-3 for Windows Upgrade Shows Speed Enhancements

HANDS ON
by Craig Stinson

Lotus Development Corp. has begun shipping Version 1.1 of *Lotus 1-2-3 for Windows*, an upgrade designed to provide performance enhancements. It's available free to registered users of Versions 1.0 and 1.0a, and you can get it either by contacting Lotus or by downloading it from Lotus's CompuServe forum. (Downloading takes several hours at 9,600 bps.)

Lotus says the current update provides relief in the time required to load *1-2-3 for Windows*, in screen response to navigation and range-selecting commands, in formula recalculation, and in printing on Hewlett-Packard printers.

PERFORMANCE TESTS

Tests on a 33-MHz 486 system with 8MB RAM, Windows 3.1,

and a LaserJet II did reveal performance improvements. Version 1.1 took 33 percent less time to load than 1.0 and ran a screen-intensive macro in 18 percent less time. An arithmetic recalculation benchmark worksheet took 11 percent less time to run.

The most dramatic performance gains showed up in the printing of a plain-text worksheet in portrait mode. Version 1.0 took 226 seconds to return control to the user and 257 seconds to finish the print job. The update returned control in 14 seconds and finished printing in 76 seconds—improvements of 94 and 71 percent, respectively.

When printing a highly formatted worksheet, including an embedded chart, in landscape mode, the new version took only 2 percent less time to return control to the user but got to the finish line in 39 percent less time. On the other hand, the

same print job in portrait mode took longer in the update than it did in the original—24 percent longer to return control and five percent longer for output.

You can also expect modest improvements in Windows resource usage. However, switching from SMARTDrive in Windows 3.0 to the vastly improved SMARTDrive 4.0 in Windows 3.1 may do more to improve the performance of *1-2-3/W* than Lotus's enhancements.

1-2-3 for Windows, Version 1.1, isn't an earth-shaking upgrade. But it is free, and if you're a registered *1-2-3/W* user you shouldn't pass it up as you wait for Version 2.0, scheduled for release in late summer.

List Price: *Lotus 1-2-3 for Windows*, Version 1.1, \$595; free to registered users of earlier versions. **Requires:** 2MB RAM (4MB recommended), 7MB hard disk space, Microsoft Windows 3.1 or later. Lotus Development Corp., 55 Cambridge Parkway, Cambridge, MA 02142; 617-577-8500.

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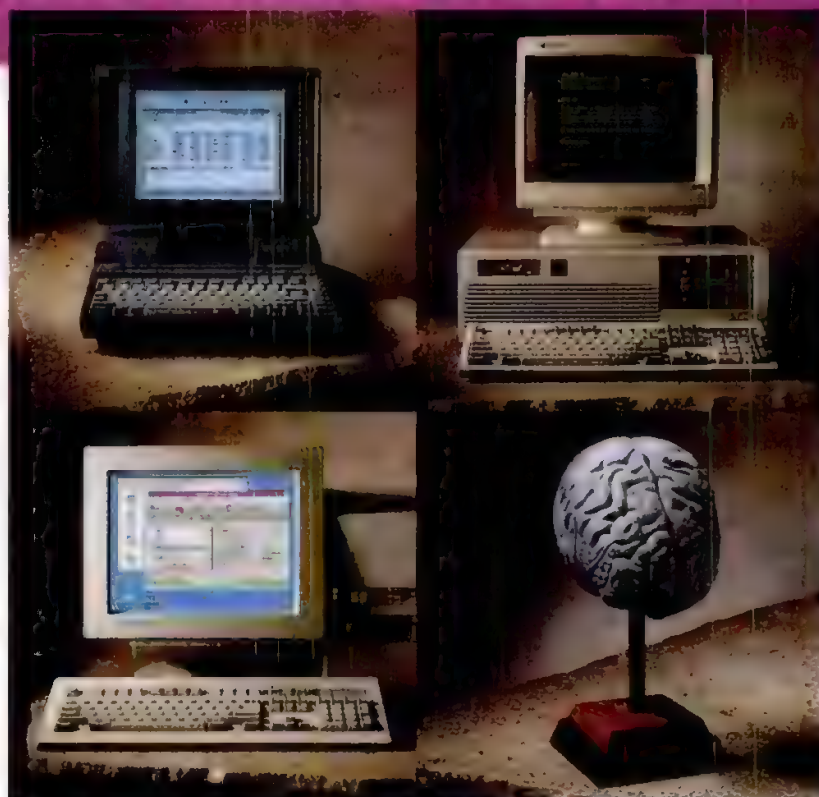
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CIRCLE 163 ON READER SERVICE CARD

by
Emerson Andrew
Torgan

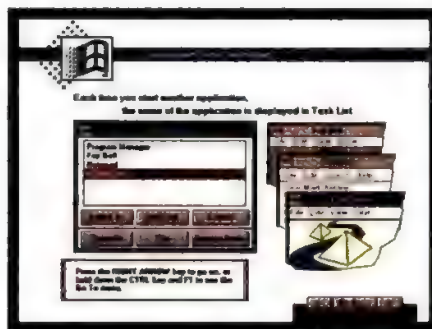
New & Improved

News of Announced Products and Upgrades

Microsoft Training Tools Ease Move To Windows 3.1

NEW Microsoft Corp. is launching a two-pronged attack in its campaign to educate support professionals and users in the finer points of the Windows environment. On the heels of Windows 3.1, the company is offering the *Microsoft Productivity Pack for Windows, Version 3.1*, as well as a training videotape aimed at helping support professionals learn the new features of Windows 3.1.

The \$59.95 *Productivity Pack* guides new users through interactive demonstrations and provides lessons focusing on TrueType fonts, object linking and embedding (OLE), and the new File Manager. Users can also access the package's on-line tutorials while working in Windows applications. The tutorials include lessons on getting started, learning windows essentials, working with applications, managing your files, organizing your work, and putting it all together.



Microsoft Productivity Pack tutorials guide users through the ins and outs of the Windows operating environment.

Upgrading to Microsoft Windows 3.1: Video Training for Support Professionals is a \$395 video course developed by Microsoft University that provides detailed information on Windows 3.1 additions and enhancements. Topics include optimizing and customizing Windows, automating installation over a network, and troubleshooting common problems. **List Price:** *Microsoft Productivity Pack* for

Windows, Version 3.1, \$59.95. Microsoft Corp., One Microsoft Way, Redmond, WA 98052; 800-426-9400, 206-882-8080.

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List Price: *Upgrading to Microsoft Windows 3.1: Video Training for Support Professionals*, \$395; student guide and lab disks, \$99 per set. Microsoft University, 10700 Northup Way, Bellevue, WA 98004; 206-828-1507.

CIRCLE 409 ON READER SERVICE CARD

Webcorp Debuts Redesigned Network OS Architecture

IMPROVED Webcorp's peer-to-peer network operating system, *WEB, Version 3.0*, features a completely new modular design consisting of six loadable modules that can be installed separately to meet the needs of each workstation. Each module can be loaded into upper memory blocks, using no memory in the 640K memory area.

WEB also sports a new proprietary "burst mode" technology, supporting high data-transfer rates between stations, and Dynamic Data Compression, increasing throughput speeds, according to the vendor. A redesigned printing architecture enhances printing speeds, optimizes Windows printing, and offers support for PostScript printers. Network password protection, remote diagnostics, and an on-line error logging system that tracks networkwide errors have also been added.

List Price: *WEB, Version 3.0*: for single-user version, \$99; for five-user version, \$449. Webcorp, 3000 Bridgeway, Sausalito, CA 94965; 415-331-1449.

CIRCLE 410 ON READER SERVICE CARD

Baler Compilers Offer New Interfaces And Compatibility

IMPROVED Baler Software Corp.'s updated versions of its spreadsheet compilers, *Baler 6.0* and *Baler XE 2.0* (eXtended Edition) incorporate spreadsheet publishing output, new Windows-like user interfaces, enhanced compatibility with *Lotus 1-2-3*, and a new Baler Workbench menu-driven front end. The Workbench provides a single screen with dialog boxes for point-and-shoot access to the programs' development tools.

HOT PROSPECT

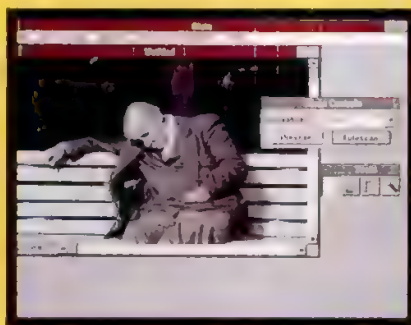
OFOTO SCANS, SCALES, STRAIGHTENS, AND CROPS IMAGES AT THE TOUCH OF A BUTTON

Wouldn't it be nice if scanning images were easier than using a fax machine? It is. **Light Source's Ofoto for Windows, Version 1.0**, promises to be the first image scanning software that fully automates the scanning process, producing accurate reproductions of gray-scale photographs and line art at the touch of a button.

The user simply places an image onto a flatbed scanner and selects the printer to be used; a single mouse click then begins the Autoscan process. During the prescan phase, the software identifies the original image as either gray-scale photography or line art. The package then scans the image, automatically setting variables such as dots-per-inch and bit-depth for the selected printer. *Ofoto* can reduce or enlarge the image, set the resolution, and automatically straighten the image. Extra white space is cropped and the AutoSharpen feature sharpens the image. Users desiring more control can run the prescan sequence separately and manually edit the preview scan.

Ofoto for Windows is bundled with the new Apple OneScanner for Windows and supports units from Epson, Hewlett-Packard, and Microtek.

List Price: *Ofoto for Windows, Version 1.0*, \$395. Light Source Inc., 17 East Sir Francis Drake Blvd., #100, Larkspur, CA 94939; 800-231-7226, 415-461-8000.



Ofoto for Windows uses adaptive calibration to optimize each scan for the resolution quality of the printer.

CIRCLE 407 ON READER SERVICE CARD

CONTINUES ON PAGE 60

New & Improved

BRIEFS



WINDOWS SOFTWARE

Abacus is shipping *NoMouse* for Windows, Version 3.1

(\$49.95), a software alternative to the hardware mouse that allows users to control the Windows mouse pointer via the keyboard. The new version features an inverted mouse pointer, an enhanced I-beam pointer, and an enlarged hourglass. 616-698-0330.

Automated Design Systems' *Windows Workstation*, Version 4.1 (\$995 for a ten-user server license), takes advantage of the network-aware features of Windows 3.1 to provide network administrators with a set of utilities for Windows and Windows applications control. The new version lets administrators track application usage, set workstation passwords, configure networked printers, and globally enable and disable pull-down menu options. 800-366-2552, 404-394-2552.

Individual Software's *Professor Windows 3.1* (\$49.95) offers interactive instruction for all Windows 3.1 enhancements, including the new File Manager, object linking and embedding (OLE), multimedia features, TrueType fonts, and performance improvements. The self-paced lessons include practice exercises and quizzes. 800-822-3522, 510-734-6767.

Systems Compatibility has unveiled a Windows version of *Outside In* (\$89), a file-viewing and data-transfer utility. *Outside In* lets users view files from more than 90 DOS, Windows, and Macintosh file formats and copy them to the Windows Clipboard for use in other applications. Data copied to the Clipboard retains its formatting, and the utility will print files when the application is not running. 800-333-1395.

Virginia Systems is shipping *Sonar Professional*, Version 1.0 (\$795), a text retrieval package for Windows featuring Boolean, proximity, wildcard, synonym, and phonetic search options. *Sonar Professional* uses keyword searching techniques, providing search speeds that can exceed 10,000 pages per second, according to the vendor. Search phrases are shown in context and are circled to make them more visible. 804-739-3200.

CONTINUED FROM PAGE 59

Both packages share many new features, including a spreadsheet publishing module. The module prints compiled worksheets that have an associated formatting file created when using *I-2-3's* WYSIWYG feature. New mouse support, customizable toolbars, and CUA-compliant menus make navigation easier. Additional enhancements include 22 new macro commands and support for the macro languages of *Lotus 1-2-3*, Release 2.3 and Release 3.1.

List Price: *Baler 6.0*, \$495; *Baler XE 2.0* (eXtended Edition) \$795. *Baler Software Corp.*, 1400 Hicks Rd., Rolling Meadows, IL 60008; 708-506-9700.

CIRCLE 411 ON READER SERVICE CARD

PrintCache Speeds Up DOS and Windows Printing

IMPROVED **LaserTools Corp.** is shipping its updated print-buffering utility to speed up printing in DOS and Windows. *PrintCache*, Version 3.0, is a TSR program that lets users buffer any size printing or plotting job to any available memory on their PC: RAM, extended memory, expanded memory, or hard disk.

Once the print job is initiated, keyboard control is regained quickly while printing continues in the background. *LaserTools* promises printing-speed gains of from 25 percent to 40 percent when the utility is used as a supplement to the Windows PrintManger. Installation is now simpler than in previous versions and the interface is improved. *PrintCache* supports all plotters, daisy wheel, dot matrix, and ink jet printers, as well as HP LaserJets and compatibles and PostScript printers and compatibles.

List Price: *PrintCache*, Version 3.0, \$149. *LaserTools Corp.*, 1250 45th St., #100, Emeryville, CA 94608; 800-767-8004, 510-420-8777.

CIRCLE 412 ON READER SERVICE CARD

U.S. Robotics: One Modem, Many Users

NEW **U.S. Robotics** has unveiled the Shared Access Modem Sharing Kit in both single-port and dual-port models. The kits allow for one or two V.32bis modems to be pooled across a network so users can dial out from the network.

Shared Access kits run in the background on any PC on a network and do not require a dedicated PC. They feature point-and-shoot software interfaces that offer users file transfer, remote control, terminal emulation, and application access. The kits consist of a V.32bis modem (two in the dual-port version), RS232 cabling, *On-LAN* communications software



The Shared Access Modem Sharing Kit contains everything you need to give all the users on a network access to a modem.

for dialing in and out of the network, modem-sharing software, and *Off-Site* communications software for remote users.

List Price: Shared Access Modem Sharing Kit Single Port, \$995; Shared Access Modem Sharing Kit Dual Port (two modems), \$1,595. *U.S. Robotics Inc.*, 8100 N. McCormick Blvd., Skokie, IL 60076; 800-342-5877, 708-982-5001.

CIRCLE 413 ON READER SERVICE CARD

Two PIMs Keep You on Top of Your Busy Day

IMPROVED **DayFlo Tracker Corp.** and **mB Allen** are shipping new versions of their personal information manager (PIM) software. *DayFlo Tracker*, Version 3.0, has new contact management features, including forms and reports for client records and forecasting, as well as an auto-dialing function. It also sports a new interface with pull-down menus and expanded printer support. A new import/export facility lets users exchange data with spreadsheet and database applications.

The Daily Plan-it!, Version 1.1, from mB Allen, allows you to launch DOS applications from within it and ships with an organizer wallet that holds the PIM's printouts. It uses a proprietary scheme called dynamic link interface (DLI), letting you link PIM data to applications. One drawback: The wallet is nearly a foot long. Sensitive to the size issue, mB Allen is shipping *Pocket Pak Supplement*, Version 1.2i, a checkbook-size add-on with supplemental software and printout paper. **List Price:** *DayFlo Tracker*, Version 3.0, \$249; upgrade from previous version, \$89. *DayFlo Tracker Corp.*, 18021 "J" Sky Park Circle, Irvine, CA 92714; 800-367-5369, 714-474-2901.

CIRCLE 414 ON READER SERVICE CARD

List Price: *The Daily Plan-it!*, Version 1.1, \$89.95; *Pocket Pak Supplement*, Version 1.2i, \$29.95. *mB Allen*, 1430 Massachusetts Ave., Suite C, Cambridge, MA 02138; 800-786-9161, 617-292-6494.

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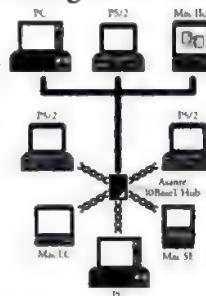
Now Asanté offers a complete line of Ethernet cards for every PC and Mac, plus a complete

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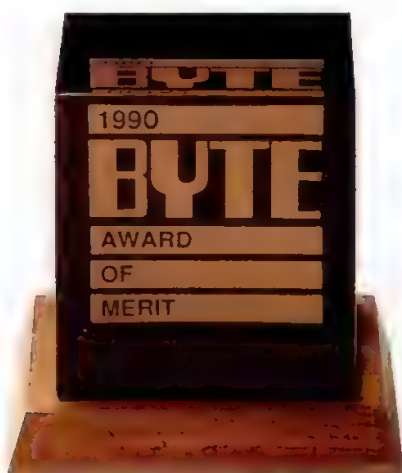
Resellers: Asanté products are available from Ingram Micro, Merisel, and Tech Data.



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In the same \$1995 package.*

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The QMS-PS® 410. There's never been a laser printer like this before. Because it has everything you need to support a small workgroup. In a mixed environment of Macintosh® and PC compatibles. But it's priced low enough for individual users.

Of course, when you look at the details, the QMS-PS 410 becomes even more impressive.

QMS has Emulation Sensing Processor (ESP) technology which recognizes incoming data streams on any of three ports and chooses the right language. So users don't have to stop what they're doing and reset the printer.

With its Simultaneous Interface Operation (SIO), the QMS-PS 410 has three ports that can spool the next document while

	QMS-PS 410
PostScript software	✓
45 resident fonts	✓
Up to 6 MB RAM	✓
Emulation Sensing Processor	✓
Simultaneous Interface Operation	✓

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printing, whether it comes from a DOS, Macintosh, or even a UNIX® system. These are both features you won't find in under-\$2,000 printers from HP, NEC, or Apple®.

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New & Improved

BRIEFS



DESKTOP PCS

Austin has unveiled four new machines: The Austin Windows Accelerator (\$2,590), the Austin Multimedia Family Package (\$1,990), the Austin 486/50 ISA WinStation (\$2,990), and the Austin 486-50e EISA WinTower (\$4,995).

The Austin Windows Accelerator consists of a 486/33 ISA system with 4MB of RAM, a 125MB hard disk, a Diamond Stealth VGA card, and a 15-inch color monitor.

The Austin Multimedia Family Package features a 386SX/20 PC, 2MB of RAM, a 40MB hard disk, a color monitor, speakers, a joystick, and Creative Labs' multimedia kit with a CD-ROM drive, a Sound Blaster Pro card, a MIDI kit, and assorted software.

The Austin 486/50 ISA WinStation is configured with 4MB of RAM, 128K of cache memory, dual floppy disk drives, a 125MB hard disk, and a color monitor.

The Austin 486/50e EISA WinTower is marketed as a file server and features a math coprocessor, 8MB of RAM, dual floppy disk drives, a 330MB SCSI hard disk, and a monochrome monitor. 800-752-1577, 512-339-3500.

CompuAdd's new 450DX2 features the speed-doubling 486 DX2 processor and is available in both full-profile (\$2,195) and tower models (\$2,395). It supports 64MB of memory on the system board and has a "hot slot" for CompuAdd's Hi-Rez VGA controller. The unit ships in standard configuration with 4MB of RAM, an 80MB hard disk, dual floppy disk drives, and a monochrome monitor.

The CompuAdd 450 (full-profile model \$2,395, tower model \$2,545) is available in the same standard configuration as the DX2 above, but features a 486DX-based processor running at 50MHz. 800-456-3116, 800-627-1967.

Micro Express's ME 486-50 (\$3,395) ships in standard configuration with 4MB of RAM, a 200MB hard disk, dual floppy disk drives, and a Hi-Color VGA card and monitor. A tower model is available (\$3,995). 800-989-9900.

lomega's Improved Beats the New Out of the Gate

NEW Just a month ago, lomega Corp. planned to ship the Bernoulli PC Powered removable disk subsystem (New & Improved, May 12, 1992). But when it discovered it could improve on the design, making it both cheaper and faster, it waited a few weeks and shipped the improved version.

The 2.75- by 6.75- by 10.75-inch Bernoulli PC Powered 90 Pro draws its power from the attached PC and features the company's new Pro drive, with a 15 percent performance gain over previous models. It offers 90MB of storage capacity in standard mode and 180MB in backup mode by utilizing the drive software's data-compression techniques. A 32K on-drive memory cache and caching software lower the effective average access time from 18 milliseconds to 9 milliseconds, and a 20Mb-per-second data transfer rate speeds the manipulation of large files, according to lomega. The unit provides SCSI capability and includes an adapter board, a 90MB storage disk, drive software, and *Central Point Backup* and *Speed Cache Plus* software. **List Price:** The Bernoulli PC Powered 90 Pro, \$855. lomega Corp., 1821 W., 4000 S., Roy, UT 84067; 800-777-6179.

CIRCLE 416 ON READER SERVICE CARD

Fastback Express: Entry-level Backup Utility for \$99.95

NEW Fifth Generation Systems knows that you'd like to back up your data regularly, but that sometimes the complication associated with backups and software prevents you from performing this essential function. *Fastback Express*, available in both DOS and Windows versions, is a reasonably priced utility that will have you backing up in no time.

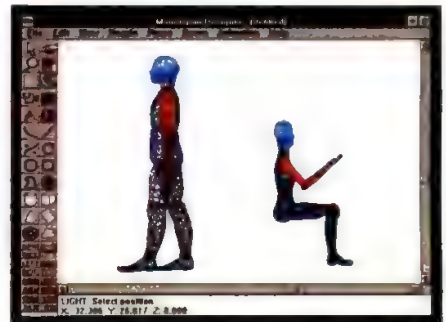
The entry-level products provide basic backup and restore functions (such as full or selective backups and restores), a write/verify option to ensure file matching between the backup and the original, and overwrite functions for flexible restoration. *Fastback Express for DOS* and *Fastback Express for Windows* feature the same data-compression and error-correction functions as their big brother, *Fastback Plus*, and they format backup disks automatically. While they don't offer the extensive features and functionality of *Fastback Plus*, they will get you into the habit of backing up your data. **List Price:** *Fastback Express for DOS*, Version 1.0, \$99.95; *Fastback Express for Windows*, Version 1.0, \$99.95. Fifth Generation Systems Inc., 10049 N. Reiger Rd., Baton Rouge, LA 70809; 800-873-438, 504-291-7221.

CIRCLE 417 ON READER SERVICE CARD

A Good Mannequin Isn't Always Hard to Find

NEW It may sound a bit like *Weird Science*, but *HumanCAD's Mannequin Designer*, Version 1.0, lets users incorporate proportioned human figures into desktop publishing presentations and animation programs. The Windows-based package can create moving or stationary figures of different genders and nationalities and offers a wide range of standard poses and movement options.

The \$99 entry-level *Mannequin Designer* lets users create human forms in four degrees of detail: stick figures, robots, outlines, and smooth figures. Each form offers a full range of motion and can be placed in any position humanly possible. Figures can be exported to animation packages, and two- or three-dimensional CAD drawings can be imported into the package to add a human element to architectural renderings.



A heavy Swedish adult male and a thin adult Japanese female? That's what *Mannequin Designer* says.

List Price: *Mannequin Designer*, Version 1.0, \$99. HumanCAD, a division of Biomechanics Corp. of America, 1800 Walt Whitman Rd., Melville, NY 11747; 800-437-4441, 516-752-3568.

CIRCLE 418 ON READER SERVICE CARD

ReadRight Personal OCR Comes to Windows

IMPROVED OCR Systems is now offering *ReadRight Personal for Windows* as a \$79.95 upgrade to *ReadRight Personal*, its DOS-based omnifont optical character recognition (OCR) package for hand scanners. The software offers users page decomposition, intelligent merging of scanned strips, dynamic image display, recognition feedback, error-checking, and auto-pasting, according to the company.

ReadRight Personal for Windows supports hand scanners from Logitech, The Complete PC, Niscan, and Marstek. Other scanners can be used by creating TIFF or .PCX images and

CONTINUES ON PAGE 66

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Acer. Giving you the power you need tomorrow, today. For more information and your free upgrade brochure, "Protecting Your Computer Investment: A Buyer's Guide to Upgradability", call us today at 1-800-SEE-ACER!

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PC World, January, 1992**

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New & Improved

BRIEFS



SOFTWARE ADD-ONS

Axcelis is shipping *Evolver for Excel* (\$345), an Excel

add-on offering genetic algorithms to create and examine a population of solutions to a problem. The best solutions survive and yield other solutions. 206-632-0885.

IntelligenceWare is shipping *Iconic Query* (\$290 per workstation), a new query tool that lets users work with icons to retrieve data from relational databases. It contains a library of icons that can be assigned to different tables, and relationships are established by drawing lines between the icons. It will operate with *Paradox*, *dBASE*, *Oracle*, *DB2*, *SQLBase*, and *SQL Server*. 310-216-6177.

Symsoft has unveiled *SlideSorter for Harvard Graphics* (\$79.95), which allows users to view 1, 4, or 16 charts simultaneously. Users are able to view multiple charts in graphics mode and cut, copy, and paste visually. 702-832-4300.

Utley-Cross is shipping the *Utley-Cross Correspondence Manager* (\$89), a program that automatically organizes *WordPerfect* correspondence by creating an address book, a catalog of summaries, and category indexes. 508-263-0386.

Intex Solutions has unveiled a new add-on for *Lotus 1-2-3 for Windows*. *Forecast! GFX for Windows* (\$165) lets users conduct three types of analyses within the Windows-based spreadsheet: time series analysis, multiple regression, and descriptive statistics. The program can generate forecasts with up to 300 historical observations and 10 variables, and forecast up to 52 future periods. 617-449-6222.

Quicksoft is shipping *Wizard's Kit* (\$37) for use with the *PC-Write Standard Level* word processor. The customization tool, which consists of a book and a software disk, offers tips for fine-tuning edit and print-control files. It also provides a description of how to write macros and how to add or change menus. The disk includes 27 files, including macros. 800-888-8088, 206-282-0452.

CONTINUED FROM PAGE 64

importing them into the program. It supports text ranging in sizes from 6 to 72 points, and retains text and formatting.

List Price: *ReadRight Personal for Windows*, \$249; upgrade from DOS version, \$79.95. OCR Systems Inc., 1800 Byberry Rd., #1405, Huntingdon Valley, PA 19006; 800-233-4627, 215-938-7460.

CIRCLE 419 ON READER SERVICE CARD

EZ-Fax Gains Novell And Artisoft Approval

IMPROVED **Calculus** is shipping *EZ-Fax for Networks*, Version 3.53, a DOS-based fax server solution compatible with most network operating systems. *EZ-Fax* is also the only fax server to carry the "tested and approved" certification for both Novell *NetWare* and Artisoft *LANtastic* network operating systems, according to the company.

The package consists of an eight-bit ISA plug-in fax card and the appropriate fax, printer, and scanner software drivers. New features include client notification of fax transition status and a report-printing function for the various activity journals. *EZ-Fax for Networks* ships with an EZ-Fax96 9,600-bps fax card, featuring a dual-processor design that lets users perform faxing functions and work in applications simultaneously.

List Price: *EZ-Fax for Networks*, Version 3.53, \$899 (up to eight stations); \$1,299 (unlimited stations). Calculus Inc., 1761 W. Hillsboro Blvd., #404, Deerfield Beach, FL 33442; 305-481-2334.

CIRCLE 420 ON READER SERVICE CARD

After All, Time is Still Money

IMPROVED **Timeslips Corp.** has added more than 100 new features and enhancements to its time-tracking, billing, and profitability management software, *Timeslips 5*. The latest version ships with more than 12 new reports, including work-in-progress, flat-fee profitability, and client-history reports.

Designed to accommodate larger companies, *Timeslips 5* now handles up to 30,000 clients, while the memory requirements of the TSReport feature have been decreased, according to the vendor. TSTimer, a memory-resident time and expense tracker, now accepts up to six billing rates per user, and a database and spreadsheet import module, previously available separately, ships with the package. Additional new features include multiple-project records for a single client, duplicate file alarms, and password security.

List Price: *Timeslips 5*, \$299.95. Timeslips Corp., 239 Western Ave., Essex, MA 01929; 800-285-0999, 508-768-6100.

CIRCLE 421 ON READER SERVICE CARD

Graphics Utility Puts an End to The Dreaded Jaggies

NEW Using a technique called anti-aliasing, **Ray Dream's** *JAG for Windows 3.1* removes the jagged edges that are the scourge of color and gray-scale graphic images. With a single mouse click, *JAG* alters completed images by filling in color variations to blend the edges into the background.

For additional fine-tuning, users can opt to restrict smoothing to a portion of the image, as well as rotate, crop, and flip the image. *JAG* also functions as a file conversion utility, converting between such formats as .GIF, .TIFF, .PCX, .BMP, and .TARGA. It can also convert files to NTSC colors for video output.



JAG uses anti-aliasing to blend the jagged edges of images into the background.

List Price: *JAG for Windows 3.1*, \$99.95. Ray Dream Inc., 1804 N. Shoreline Blvd., Mountain View, CA 94043; 415-960-0768.

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Lotus Unveils Personal Spreadsheet For the Home PC

NEW **Lotus Development Corp.**'s *1-2-3 for Home*, Version 1.0, is the company's first spreadsheet designed specifically for the home user. The package boasts a set of 50 application templates for personal and household financial matters and offers a combination of spreadsheet, database, and graphing functions. Users can create pie charts, line graphs, and bar graphs, and can even employ the software's 3-D effects to jazz up the output.

The templates, called SmartSheets, are 1-2-3 worksheets containing formula and style formats. A user simply enters the numbers and 1-2-3 for Home calculates the results in areas such as investment reviews, life insurance needs, and mortgage refinancing. It can even help create a college funding plan.

List Price: *Lotus 1-2-3 for Home*, Version 1.0, \$149. Lotus Development Corp., 55 Cambridge Pkwy., Cambridge, MA 02142; 617-577-8500.

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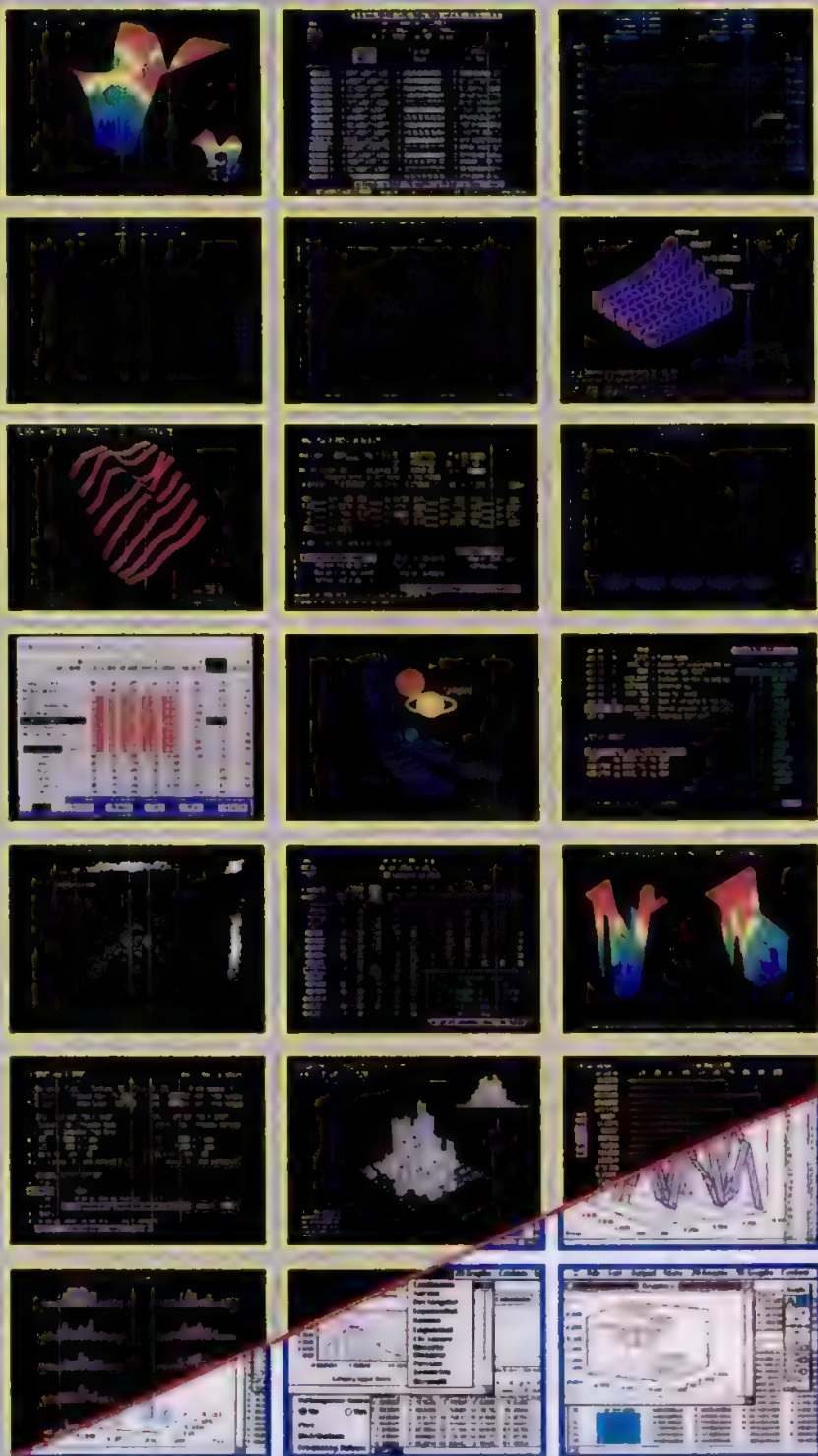
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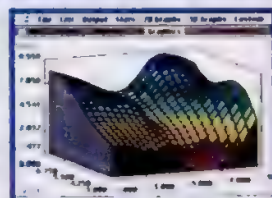
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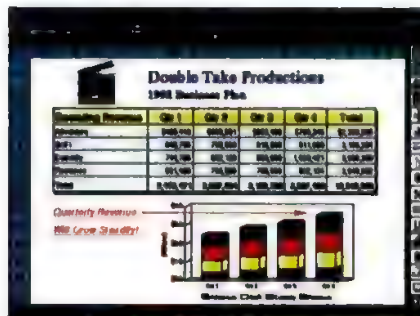
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edited by
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Reviews of the Latest Books for the PC User

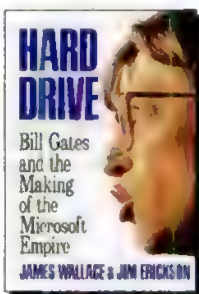
Unauthorized Gates Bio Struggles to Reveal the Man Behind the Myth

For those of you who haven't read much about Bill Gates, *Hard Drive*, by Seattle Post-Intelligencer reporters James Wallace and Jim Erickson, is a decent introduction to Microsoft's controversial founder. But for anyone who hopes to

gain some insight into the mind of arguably the most powerful executive in the PC industry and the most wealthy person in the country, *Hard Drive's* two-dimensional caricature is likely to disappoint.

Much of *Hard Drive* focuses on the computer-age whiz kid at Seattle's prestigious Lakeside prep school and the poker-playing undergraduate at Harvard. It isn't until Microsoft's work with IBM on the original PC, nearly halfway through the book, that the authors have anything new to add to the 36-year-old CEO's life story. It's been widely reported that Gates persuaded IBM to choose the 16-bit 8088 over the 8-bit 8080 chip, but IBM employees claim it was their idea. According to the authors, IBMer Jack Sams clears up the discrepancy: "We had selected the 8088 for reasons of our own, but we did not tell that to Bill," says Sams. "I'm sure he believes he suggested it to us."

Hard Drive coauthor Wallace may well have been the first journalist to interview George Gilbert, a Lotus Development Corp. product manager and Gates fan who was lucky enough to have had dinner with Gates and unlucky enough to have sent a memo about Gates's



pro-Windows, anti-OS/2 comments to his bosses at Lotus. The story made its way to *Infoworld*, where it was embellished, say *Hard Drive's* authors. Gilbert is aghast that his indiscretion added to Gates's troubles: Microsoft's break with

IBM and the FTC's investigation into whether Microsoft had an unfair advantage in developing Windows apps.

The picture of Gates *Hard Drive* presents is little more than a cartoon: half computer genius, half business bully. Only the last 20 pages offer a glimpse of what may have driven Gates to create the most successful software company in history: "In the spring of 1991, a confidential memo from Bill Gates to key executives, outlining potential 'nightmare' scenarios for Microsoft in the year ahead, was leaked to the press. A very different portrait of the

Getting Gates's Story: A View from Outside

One reason *Hard Drive* may lack insight is that its authors, who claim Microsoft discouraged the book, got only a 45-minute interview with CEO Gates for a five-part series in the *Seattle Post-Intelligencer*. After the series was published, says author James Wallace, Microsoft spokesperson Marty Taucher "chewed me out for nit-picky things that were wrong." Microsoft, he complains, "thought we focused too much on Bill's personal life. Since I don't cover computers, they felt I shouldn't be the one to tell the story, so they went out of

their way to tell people not to talk to me." Taucher, who says Microsoft never did anything to halt the book, explains that the articles "had a lot of factual inaccuracies and were badly written. Those guys clearly didn't know anything about PCs or the industry."

A more informed view may arrive this fall when Doubleday publishes *Gates*, an independent biography written by *PC/Computing's* Stephen Manes and *Seattle Times* high-tech writer Paul Andrews. The authors interviewed Gates several times for their book.—MKF

'megalomaniac' Gates that some in the industry pictured emerged. The memos [sic] revealed a Gates motivated by fear, rather than arrogance." *Hard Drive* might have been better if the authors had figured that out 400 pages earlier. —Mary Kathleen Flynn

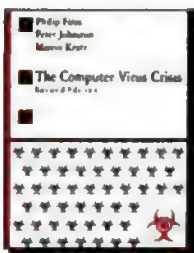
Hard Drive: Bill Gates and the Making of the Microsoft Empire

by James Wallace and Jim Erickson, \$22.95, John Wiley & Sons, 605 Third Ave., New York, NY 10158; 800-225-5945. ISBN: 0-471-5686-4.

CIRCLE 472 ON READER SERVICE CARD

Virus Guide Dispels Michelangelo's Legacy, Offers Hope for Averting Attack

The fact that the Michelangelo virus did not cause widespread destruction has resulted in something of a backlash: Many users, attributing the publicity to media sensationalism, may have put the issue of viruses out of their minds altogether. That could be Michelangelo's most dangerous legacy, because virus infection threatens all but the most isolated PC



user. *The Computer Virus Crisis*, by Philip Fites, Peter Johnston, and Martin Kratz, provides a good, largely non-technical introduction to the widening dimensions of this uniquely vicious form of computer vandalism.

The authors begin with a conceptual discussion of what viruses are and how they spread, and then explore differ-

ent varieties of the malicious codes including worms, Trojan horses, and actual viruses. They also introduce two ideas to which all users should pay close attention. First, by practicing certain basic safety habits, you can greatly diminish the potential for virus-inflicted data disaster. Common-sense steps, such as maintaining current backups and avoiding pirated software, are hammered home throughout the book. Second, the connectivity revolution, with all its benefits, also has an ugly side. The trend toward connected PCs—whether over

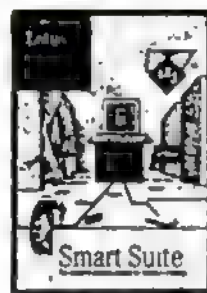
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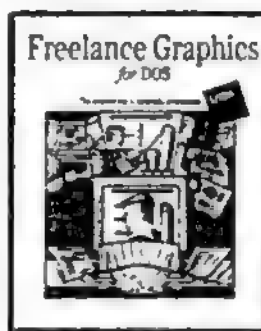
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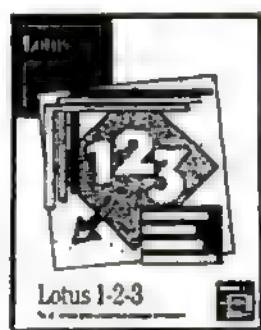
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CIRCLE 282 ON READER SERVICE CARD

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networks, file-transfer cables, or modems—offers multiple avenues for infection.

Subsequent chapters discuss methods of detecting and coping with infection. The authors also offer a thought-provoking analysis of legal issues from both civil and criminal perspectives. A several-hundred-page reference includes an extensive listing of known viruses and a list of software that can protect against infection or help clean up the mess it causes. A read through *The Computer Virus Crisis* now may well help you avert a virus strike.

—Jonathan Matzkin

The Computer Virus Crisis.

by Philip Fites, Peter Johnston, and Martin Kratz, \$29.95, Van Nostrand Reinhold, 115 Fifth Ave., New York, NY 10003; 800-926-2665. ISBN: 0-442-00649-7.

CIRCLE 473 ON READER SERVICE CARD

Clipper 5 Guide: From Ultimate Xbase Compiler to All-Purpose Language

The release of *Clipper*, Version 5, brought some new programming ideas to the realm of Xbase programming. So new are its concepts that Nantucket Corp. has been trying to reposition *Clipper* from its status as the ultimate Xbase compiler to the rank of general-purpose language for developing applications of all kinds. Whatever it is, one thing's for sure: *Clipper 5* takes time to learn, and that's a problem.

Fortunately, there's a solution: *Clipper 5: A Developer's Guide* is filled cover-to-cover with useful examples and solid writing. Authors Joseph D. Booth, Greg Lief, and Craig Yellick are *Clipper* experts, and it shows. The authors do assume some programming knowledge, but this is clearly the place to start if you've pro-



grammed in another language and need to learn *Clipper*.

The book succeeds in part because of its exceptional organization and clarity. The authors break down *Clipper* programming into 28 logically designed chapters, each with an opening overview and closing summary.

The scope of *Clipper 5: A Developer's Guide* is exhaustive, but not at all overwhelming. First, you learn in detail how to compile and link a *Clipper* application. Then you learn all about the *Clipper* language, including data types, operators, variable scoping, and arrays. The authors cover all of the new features such as code blocks, object classes, and the preprocessor. They also teach techniques for program design, the art of the user interface, and the

design of the database file. A chapter on debugging covers the new *Clipper* debugger.

Many useful tips and routines are spread throughout the book. Need a routine to parse a string into an array? Check page 905. How about a routine to search the path looking for a file? See page 966. The only topic the authors don't cover is *Clipper*'s Extend system interface. All of the code in the book is included on one 5.25-inch disk in self-extracting compressed format.

At \$44.95, *Clipper 5: A Developer's Guide* is among the higher-priced selections, but it's worth every penny. If you ever plan on buying a *Clipper* programming book, this is the one to buy.—Sal Ricciardi ■

Clipper 5: A Developer's Guide.

by Joseph D. Booth, Greg Lief, and Craig Yellick, \$44.95, M&T Books, 411 Borel Ave., San Mateo, CA 94402-3522; 800-533-4372, 800-356-2002. ISBN: 1-55851-242-X.

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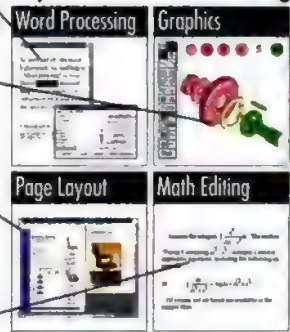
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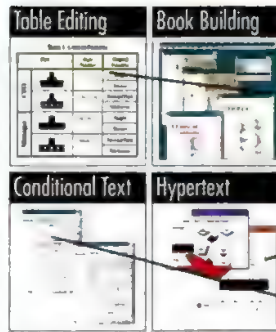
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Desktop Communications
February 1992

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Windows Watcher
January 1992

If you're tired of waiting for Windows to print, the LaserMaster WinPrinter can help eliminate output bottlenecks, and give you overall performance and print quality that is easily equal to other 4-page-per-minute printers.

PC Publishing & Presentations
November 1991

PC Sources
December 1991

PC Magazine
March 17, 1992

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CIRCLE 237 ON READER SERVICE CARD

edited by
Trudy Neuhaus

Toolkits

Reviews of the Latest Tools for the PC Programmer

Fortify Visual Basic with Microsoft's Professional Toolkit

Visual Basic from Microsoft is a revolutionary product with a new paradigm for Windows programming, but it lacks the robust tools offered in a professional development environment. But Microsoft's new Professional Toolkit for Visual Basic fortifies VB with a host of add-ins, including new custom controls, tools to create installation and help modules, support for large arrays, and almost 100 pieces of vector and bitmapped clip art.

One of VB's assets is its extensibility. You can call external DLLs from your VB programs as you can with most other Windows programming languages. But you can also extend VB with DLLs called *custom controls*. You can write these yourself using the Control Development Kit (CDK) included in the Professional Toolkit, or you can use controls created by Microsoft or third-party vendors. The Professional Toolkit for VB is a collection of 21 of these controls. Eight were created by Microsoft, and 13 were licensed by Microsoft from third parties. All can be added to VB's toolbox.

Microsoft's Grid control provides you with a spreadsheet interface; that is, a scrollable array of rows and columns in which you can have one or more cells highlighted. It is just an interface, however. If you want the functions and capabilities of a true spreadsheet, you'll need to supply the underlying arithmetic code.

The Graph control, from the British developers Bits Per



Second, is an impressive collection of routines. You can choose a property when you design the program or at runtime to display 2-D or 3-D pie or bar charts, Gantt charts, or several other chart types. Each type also has subtypes you can choose under program control.

Two more controls that can help you create professional-looking applications are the MDI (Multiple Document Interface) Child and CMDialog controls. MDI Child provides an incredibly simple way to specify that your main window can have child windows that the user can minimize or maximize, all following the Windows MDI specification. Just draw the MDI control and then add any needed controls. To get multiple MDI windows, merely set one up with all the subcontrols you want, copy it to the Clipboard, and paste it to a control array.

The CMDialog, or Common Dialog control, is a standard of set dialog boxes for operations such as opening, saving, and printing a file, as well as for choosing fonts and colors.

Unfortunately, these two controls aren't perfect. VB limits the number of MDI children to those you have explicitly drawn, so there will be an artificial limit. And it is unusual to have CMDialog as a control rather than just as a set of routines you can call.

Over half of the controls in the Professional Toolkit are enhanced versions of those in the original release of Visual Basic.

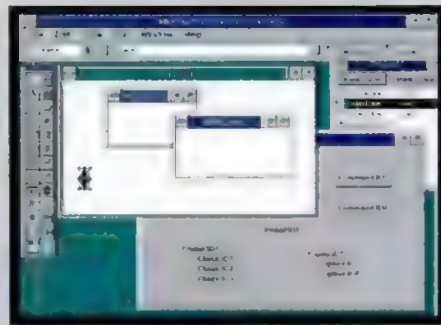
Sheridan Software now offers a set of six 3-D controls that includes a 3-D check box and radio button, and OutRider Systems has improved its set of Spin controls.

MicroHelp enhanced its Key Status control (used to display and modify the keyboard state of the CapsLock, NumLock, Ins, and ScrollLock keys) and Gauge control. Crescent Software's scroll bars go beyond those in VB by sending messages every time the scroll bar is moved. And Desaware's Animated Button control now includes many of the properties found in its Custom Control Factory. (Both MicroHelp's VBTools and Desaware's Cus-

having to access a separate picture box! Finally, an OLE Client (but not a Server) control and two controls for Pen Windows are also included.

VB Professional has a help file documenting the Windows API and declarations for calling the API from VB, but it's the Windows 3.0 API, not the API for Windows 3.1. This is unfortunate, because the Windows 3.1 help file documents some undocumented 3.0 structures such as Program Manager's Group file structure.

The Windows help compiler is also included to let you write your own on-line help—but again, it is the Windows 3.0 help compiler.



VB Professional's custom controls include MDI Child, spin controls, and several 3-D controls.

tom Control Factory were reviewed in the December 31, 1991 issue.)

Under ordinary VB, if you have a lot of bitmapped images you wish to use in a program, you either need to set up many picture controls on your application or load bitmaps as you go. Microsoft's Picture Clip control lets you merge an array of bitmaps into a single bitmap called the *source* bitmap. Then when you need to access an icon (or bitmap), you use Picture Clip to select the region in the source bitmap that contains the icon—much simpler than

VB Professional is a useful combination of controls. If you are a serious VB user, or if you are developing applications in VB, you should invest in the Professional Toolkit.

—Barry Simon

Microsoft Professional Toolkit for Visual Basic

List Price: \$299; bundled with Visual Basic, \$495. **Requires:** Windows 3.x, Visual Basic 1.0 (for unbundled version), DOS 3.1 or later. Microsoft Corp., One Microsoft Way, Redmond, WA 98052; 800-426-9400.

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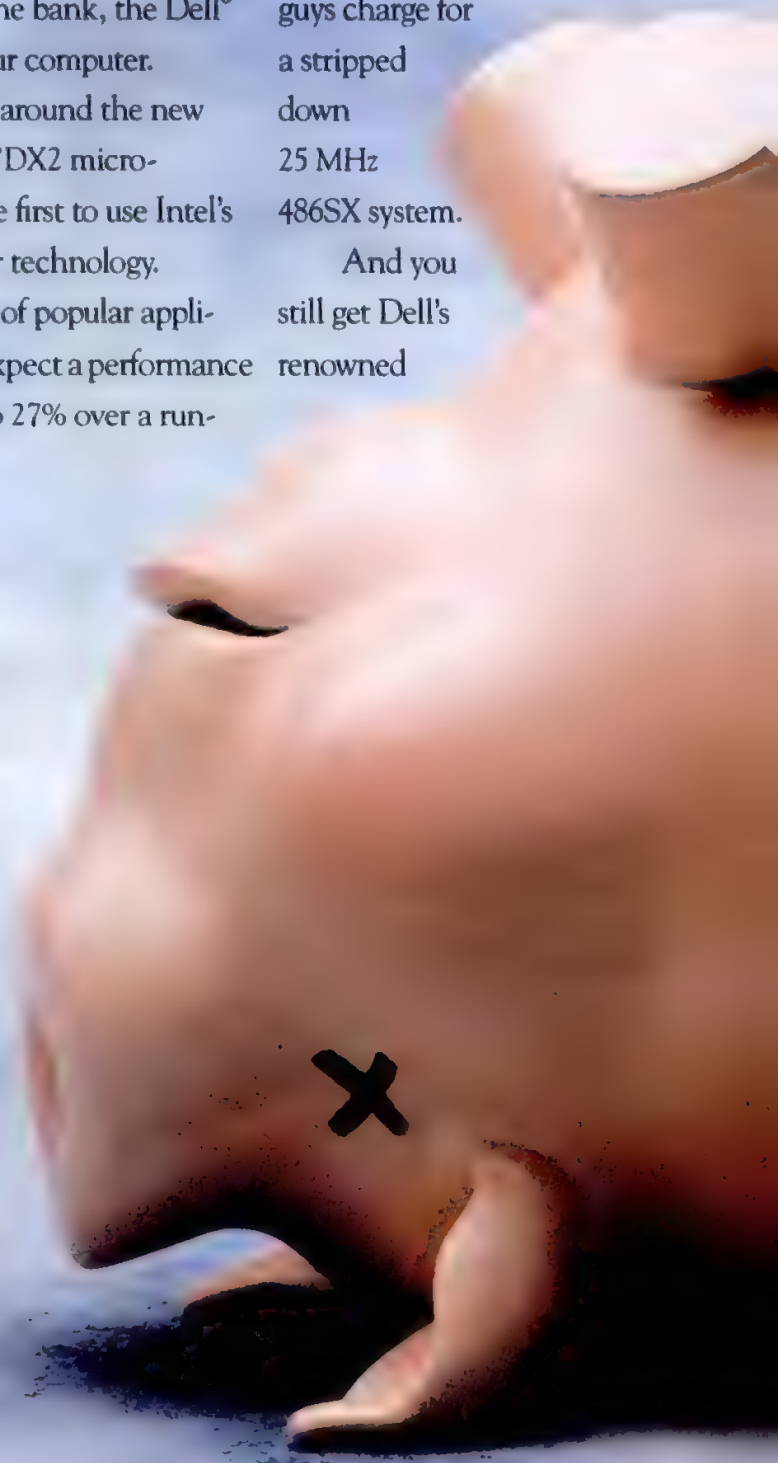
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CIRCLE 388 ON READER SERVICE CARD

Michael J. Miller



Project Management For the Real World

It's time to rethink the design of project management software. Managers need the tools but not the complexity.

Productivity software has come a long way in the past decade. Everyone would agree that word processors, spreadsheets, and graphics programs are markedly faster, more powerful, and easier to use than ever before.

Despite a lot of talk, though, computers really haven't done a great job in helping people run their businesses—at least when it comes to managing people, projects, time, and money. That's a shame, because there is software designed for that purpose: project management packages. But these packages have been relegated to a very narrow group of project management experts and are not used by the typical manager.

Lately I've been playing around with the current Windows versions of a few project managers, including *CA-SuperProject for Windows*, *Microsoft Project for Windows*, and *Time Line for Windows*. All of these pro-

grams do their best to take full advantage of the graphical environment by adding toolbars, so you perform common operations by just clicking on an icon. These are the kind of ease-of-use tools we've already seen in word processing and spreadsheets, but we're also beginning to see more direct manipulation of project scenarios. For instance, we can now adjust a task to cover a different period of time by just dragging on the bar representing the time period in a Gantt chart (which shows tasks over time).

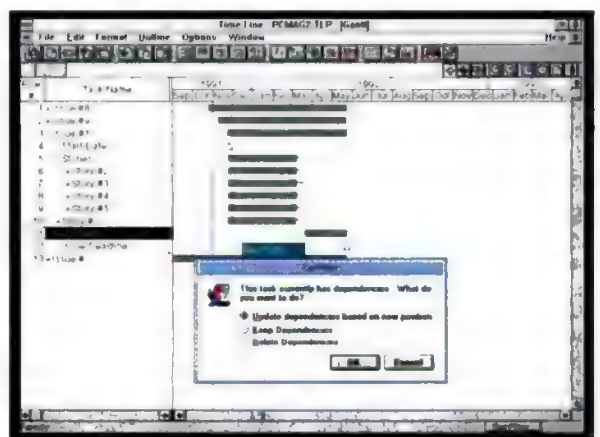
While such advances are steps in the right direction, project management software is still quite complicated and still designed for people who have formal training in project management or who do project management as a major part of their jobs. This is partially the result of the complexity of the concepts. There are dependencies, critical path management (CPM) calculations, and even project evaluation and resource tracking dia-

grams (PERT charts). I sometimes wonder whether resource leveling—getting the available people and equipment to match up with the tasks to get the project done as fast as possible—is a science or a black art.

In business today, there are plenty of people (not just professional project managers) who could use a project management program, but who don't have the right background. Lots of managers have to keep track of people, money, time, and projects. Unfortunately, for most of us, project management software is simply too complicated or too time-consuming to use. One solution has been to use personal information managers or other packages designed for tracking projects easily. That's better than nothing, but typically such programs don't do much more than remind you when a critical date has passed. They often can't show you conflicts ahead of time and certainly can't reassign tasks to other people, the way resource leveling can in higher-end packages.

I'd like to see the power of a full-fledged project management system channeled into a new user interface that's more in keeping with the way a typical businessperson works.

Some of this can be accomplished by adding new features on top of existing inter-



Time Line's Co-Pilot makes project management easier, but for running a typical business, we need more.

faces. One step in the right direction is the Wizard feature that Microsoft has added to the most recent version of *Project*. Wizards, which we first saw in packages like *Microsoft Excel* and *Microsoft Publisher*, act as very sophisti-

Michael J. Miller

cated macros designed to help you step through a complicated process. But rather than being oriented toward a program's function, Wizards focus on tasks the user is trying to perform.

In *Project*, the Wizards walk you through common operations, such as cre-

ating a new project and resolving conflicts. A Wizard asks you questions, guiding you through various functions to help you complete your project. This is useful both for getting work completed quickly and for coaching you to do the task yourself. Wizards are a good training tool, but they can be slow and inflexible, perhaps because they have to be general.

Time Line, from Symantec, takes a somewhat different but still helpful ap-

proach with its Co-Pilot feature. Co-Pilot is an intelligent help engine that prevents you from doing anything wrong to your plans for tasks and resources. If you move a task on your schedule, Co-Pilot will ask you whether you want it to start after the task before it on the list or start or end on a fixed date. Co-Pilot is a great idea, but I'd like to see it applied to more situations.

Having a Wizard or a Co-Pilot companion is helpful, but it's only a start. Developers need to rethink the entire user interface to appeal to the user who doesn't know much about project management.

I've used a number of project management systems, but I'm no expert. For me, the problem isn't so much figuring out how to use the package, but understanding what the software is doing and whether it's doing what I want it to do.

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CIRCLE 031 ON READER SERVICE CARD

THE PC MAGAZINE PROJECT

For instance, I've been trying to make a model of the way we prepare comparative product reviews at *PC Magazine*. This sounds fairly simple, but it's really amazingly complex. We tend to have the same people working on multiple projects all the time. The projects always overlap. They often move from one issue to another. And when we are running late with one part of a review (such as testing) we need to make up for it in another part (such as editing) and still make deadline. So do we want our tasks to start "as soon as possible" or "as late as possible"?

The answer, thanks to some help from the folks at Symantec, is a combination that was anything but obvious to me when I started out. This, then, is the big issue: In order to use any of these systems effectively, you have to understand the project and how it is supposed to work, your own organization and how it works, and the project management software and how it works. It is all a bit too complicated for everyday office work.

What's the answer? I think that future variations on and enhancements to Wizards and Co-Pilots will certainly help. Perhaps in project management and in other categories, we'll see Wizards developed for particular tasks, tasks everyone does, or tasks specific to individual industries. We may need alternate user interfaces, perhaps with terminology for people who aren't experts—exactly what Symantec has attempted with *OnTarget*.

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	Panasonic KP-F180	209
	Panasonic KP-F1124 Dot Matrix	179
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CIRCLE 329 ON READER SERVICE CARD

Bill Machrone



User Groups Go High(er) Tech

With a dazzling new survey, user groups put themselves on the map of statistical respectability.

PC Magazine has always been close to user groups. I've given speeches at user groups all over the country and have asked for a show of hands of how many people read *PC Magazine*. The response is always nearly unanimous. It figures. Most people join a user group for many of the same reasons that they read *PC Magazine*: They want guidance and support on hardware and software purchases, and they want help from experienced, informed people.

I have always felt this kinship at the gut level and am pleased to see it confirmed in an impressive survey that studies user-group demographics. The survey was sponsored by the Association of Personal Computer User Groups, IBM, Intel, and Lotus.

Conducted among nearly 3,000 members of a dozen user groups, the survey used a high-tech methodology that suited this audience:

The questionnaire was distributed on-disk. The survey program used was Ci2 from Sawtooth Software, which has distilled this disk-based survey technique to the point where both the questions and the responses are loaded directly onto the disk. Users load the program, which then prompts them for, and records, their answers. The company, which calls its product a "computer-assisted interviewing system," has built in some nifty features such as randomizing the order of blocks of questions, a technique that minimizes what statisticians call order biases. Like our on-line surveys on PC MagNet, there's no fine print that says, "If you answered no to question 14, skip to question 20." All the branching logic is handled by the program. The respondents sent their completed survey disk to the data analysis company using an included postage-paid disk mailer.

The survey company concatenated the individual responses into a single file and converted it to ASCII. They then fed it into *SPSS/PC*, a well-known statistical program, which prepared the analysis. Neat, huh? The survey seemed neat enough to the randomly chosen user group members that 63 percent of them responded—a very respectable number.

THE ENVELOPE, PLEASE

While the technique itself was interesting, the results were even more so. User group members are, on the average, a little bit older than *PC Magazine's* average reader, and the household income is a tad lower. But you would never be able to tell them apart otherwise. They are well educated, with 27 percent having completed a master's or doctoral degree. Both groups are gainfully employed, with a higher proportion of consultants and self-employed individuals in the user groups. The range of jobs that people in both groups hold is similar, too—heavily biased toward professional and managerial titles. On the average, they use their PCs more than 26 hours a week.

The typical PC, at work or at home, is a 386 with from 1MB to 4MB of RAM, a hard disk larger than 40MB, a VGA display, and a modem. Windows still takes a back seat to DOS, though. The user group members average two PCs at home, and value them (hardware and software) at nearly \$4,800 apiece, once again confirming Machrone's Law: The machine you want always costs \$5,000.



ILLUSTRATION: KRIS WILTSE

At work, the average member recommends or approves \$89,800 per year on PC purchases, somewhat less than the *PC Magazine* average, but respectable nonetheless. This purchasing power is a key reason why marketers are so interested in user groups and why they've targeted user groups for special attention.

Not surprisingly, user group members rate computer magazine articles and reviews as the single most useful source of information, followed closely by the recommendations of friends and colleagues. Manufacturer's litera-

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Bill Machrone

ture and ads in computer magazines tie for the next rung down; then there's a fairly dramatic drop when we get to ads in general and business magazines. Consultants, VARs, and retail PC stores bring up the rear. We've been doing the same kind of research for years, and the numbers haven't changed much.

One of the most interesting sections of the survey deals with shareware. User group members are overwhelmingly familiar with shareware, and on the average have tried nine different programs. They currently use four shareware programs, but have, on average, registered only 2.5 of them. The main reasons that user group members give for registering shareware are that they liked the product (42 percent) and that they support the concept of shareware (37 percent). The other reasons they register are, in declining order: to get the latest version, to get the printed manual, or to receive tech support. I hope that their belief in the concept encourages them to register the other 1.5 products!

Fully 43 percent of the members say that the aspect they like best about their user group is its newsletter, and that's not surprising when you look at some of them. Many user groups publish excellent newsletters, chock full of reviews and tips—the same things members enjoy in *PC Magazine*. Can't these people ever get enough? Seriously, it shows dramatically how dependent all of us are on timely, accurate information, as well as corroboration from multiple sources.

Sometimes I feel like a cheerleader. Over the years, I've encouraged *PC Mag* readers to join user groups and encouraged manufacturers to support user groups, especially by demonstrating new products. This latter strategy has worked well for manufacturers. The survey shows that half of the members who see a vendor presentation are likely to buy the product in the next 12 months. Even if they don't buy right away, three-quarters of them say that the presentation increased the likelihood that they would eventually buy the product. A similar number found that the presentation raised their opinion of the vendor, a valuable commodity in a market where so much still depends on the recommendation of people you trust.

User groups are still growing and prospering. And now they have a survey to prove it. ■

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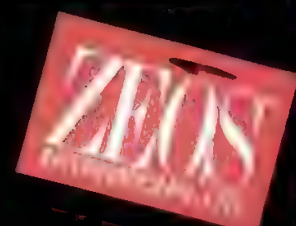
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So Do Notebook Users.

Source: PC World survey of customers who own
Notebooks, January, 1992.

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John C. Dvorak



The Microsoft Storefront

Where will Microsoft direct its next growth spurt? Ruling the retail channel may satisfy its yearning for control.

What will Microsoft do for an encore? It dominates every aspect of the software industry and controls the destiny of other software companies and hardware companies alike. It knows how to spend money to win, and it knows how to win. In short, the company is on a roll. The bad news is that nothing lasts forever. What's going to happen to stop Microsoft and what will the company do about it?

There are three roadblocks to continued dominance. The first is the Apple lawsuit over Windows. Microsoft appears to have won, but we can expect more fighting from lawsuit-crazed Apple. Let's overlook this potential disaster for the moment. Looks

like nothing will come of it.

The second roadblock is the long-running FTC investigation. It limps along. As an aside, it's apparent that as Bill Gates's wealth becomes more of an inconvenience for him and his friends, he might welcome the government coming in and slicing up Microsoft.

Personally, I think it's overdue. Microsoft should be four companies: systems, languages, applications, and information publishing (books, CD-ROMS). Gates would end up with hard cash for the three he spun off. He could stay with the fourth or start over someplace else, proving that he was smarter than old foes like Steve Jobs who couldn't repeat their successes. Or he could take a needed vacation and buy a country or two.

Of course, none of this will happen while the laissez-faire Republicans are in the White House, so Microsoft's dominance should continue forcing Gates to keep working.

This brings us to the third roadblock: the potential of sudden disaffection by fickle retailers. I expect Microsoft's next growth phase to be the opening of a chain of software stores around the country where it can control both the shelf space and the sales pitch: "Yes, we do carry Lotus, but let me show you *Excel* before you make your decision."

Microsoft is in a great position to boost sales by retailing and cutting out the middlemen. It knows it's too big to be at the mercy of a skittish retail machine that might collectively decide that Microsoft products aren't

good or that Microsoft should be punished for its success. Retailers are also fad-oriented, and some unknown entity might come along (like *GeoWorks*) and become the rage overnight.

Microsoft executives are fretting over this possibility every waking hour. The company is too big to have so little control over the final sales pitch. They must be considering the alternative: controlling the retail channel themselves. A clue: Look for Microsoft to steal retailing specialists from companies like Wal-Mart in the next year or so. Controlling the retail channel with hundreds (thousands, maybe) of stores will allow Microsoft to increase its dominance and perhaps double or even triple in size. It has no other way of continuing its fast-paced growth.

Since Microsoft yearns for total domination of the software world, what better way than to go into retailing? Gates is very familiar with the Japanese technique of vertical integration, where one company controls everything from the parts factory to the subassembly plants, the housing for employees, the product, the ships that carry the product, and the distributor. Being as big as Microsoft will make it easy to push out retailers simply by withholding Microsoft products from them. Then it can play favorites with "friendly" software vendors.



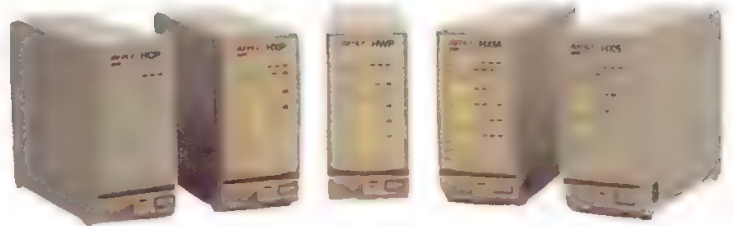
ILLUSTRATION: KRIS WILTSE

While much of Gates's early success was a lucky hookup with IBM, it is now built on a solid foundation established over the last ten years and financed by the easy-money licensing fees from MS-DOS. Once you have all the hotels on the Monopoly board, it's pretty hard to lose the game. Microsoft has all the hotels. Soon it'll have all the stores, too. ■

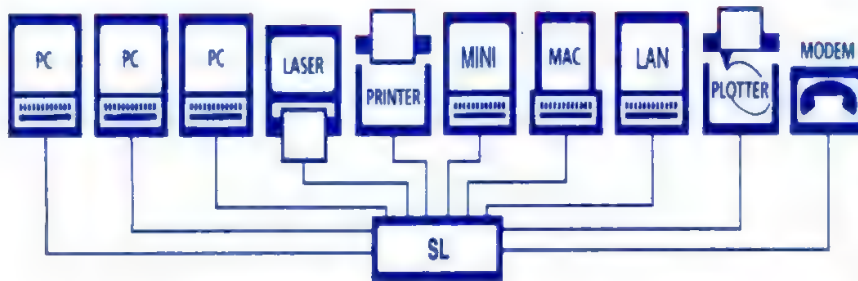
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HWP	5 Parallel	3/2, 4/1	256KB-16MB	\$295
HXP	4 Parallel	2/2, 3/1	256KB-16MB	\$245
HCP	2 Parallel	1/1	256KB-16MB	\$225
AS31	4 Parallel	3/1	None	\$175
AS41	5 Parallel	4/1	None	\$195
AS81S	9 Ser/ 1 Par	8/1	None	\$79

Inside Track

The clone market is about to **explode** as prices for powerful desktop systems **plummet**. It all stems from the introduction of more and more clones of the Intel **386 and 486 chips**. The most recent entry will come (again) from AMD, when it introduces a **40-MHz 386SX**. One observer told me that "the die size is so small that they'll be able to sell these things for \$30 if and when they want to." Such a chip will **submarine** the 386SX business and probably move Intel out of the 386SX picture. Intel will push itself further into the more profitable high-end processors.

It looks like Intel will ship its 586 or P5 chip by year's end. Expect every major vendor of clones to have a **586 machine** up and running and on the floor of Fall Comdex in November. A few sample chips should be available for private demonstrations by midyear. Quantity shipments will begin in the first quarter of 1993, and by this time next year the 586 chip will be the rage. Expect to see the chip come off the line at 66 MHz, running around **50 to 70 mips**.

Speaking of Comdex Dept.: At Spring Comdex in Chicago last April there was an interesting phenomenon. The show was split into two pieces. One was the plain-vanilla Comdex, the other was Windows World. The last time the show was in Chicago there was a similar split, with part of the show devoted to the Macintosh. The Mac show was an **incredible dud** because the MacWorld Expo had already been established as *the* Mac show. Windows-only expositions have been small, so the time was ripe for this huge Windows show. The effect was amazing: The old Comdex part was boring and dreary when compared with the liveliness in the Windows half of the show. **It was astonishing.**

I made a point of going into the Windows NT section, where one high-end vendor after another was showing all sorts of elaborate and complex applications for NT. I asked every vendor I spoke to one simple question: "Wouldn't this work better under OS/2?" Each one **swallowed hard** and sheepishly admitted that it probably would. But they were in the Microsoft NT pavilion and not in the OS/2 pavilion.

Microsoft people were **gloating** about grabbing so much of what they call "mind-share" at the show. **The constant feud** between IBM and Microsoft continues unabated. IBM threw a private bash where the theme was Karaoke sing-alongs. A slew of custom-written, **derogatory**, anti-Windows songs were showcased. Many attendees were aghast. Meanwhile, Microsofters were suggesting that because of the shortage of 3.5-inch disks, it might be worthwhile to take

advantage of the \$49 OS/2 offer just to nab the 18 disks that come with the package and **use them for blanks**.

While Microsoft employees were living it up at the show, the mucky-mucks in the executive suites back in Redmond were abuzz about review copies of the **critical new book** about Bill Gates entitled *Hard Drive—Bill Gates and the Making of the Microsoft Empire* (John Wiley & Sons, \$22.95). While the book seems preoccupied with Gates's spotty grooming habits, there are a lot of interesting tidbits concerning **dubious business practices** that Microsoft will have to explain. I confronted a Microsoft spokesperson with the following passage from the book:

According to one Microsoft programmer, the problems encountered by Lotus were not unexpected. A few of the key people working on DOS 2.0, he claimed, had a saying at the time that 'DOS isn't done until Lotus won't run.' They managed to code a few hidden bugs into DOS 2.0 that caused Lotus 1-2-3 to break down when it was loaded. 'There were as few as three or four people who knew this was being done,' he said. He felt the highly competitive Gates was the ring-leader.

The response from the spokesperson was, "It's simply not true. They lie!" In

fact, if it could be proven that Microsoft did such a deed, it would be a **nightmare** for developer relations that will be badly shaken by the book anyway. It seems to me that this kind of **accusation is bogus** unless some top coders disassemble DOS and show obvious embedded bugs. As yet, nobody has bothered.

Genuinely Interesting Hardware Dept.: There are diagnostic tools and there is PocketPOST—a \$199 minicard that pops into any PC or ISA slot. It includes a complete diagnostic system that can **pinpoint any PC failure** (including boot failure). The product comes from Data Depot (1710 Drew St., Clearwater, FL 34615; 800-275-1913). When combined with *Remote RX* software (\$100 when purchased with PocketPOST) there is no problem that can't be resolved. It can even isolate a single bad memory chip and show you which chip to pull. This is **an amazing system** that's equaled only by equipment selling for thousands of dollars. **You'll be a hero** in your company if you own PocketPOST and *Remote RX*. If you have anything to do with maintenance or repair, call these guys immediately. Also, ask about Data Depot's inexpensive (but outstanding) *PC Certify*—a program that certifies compatibility. **Highest recommendation** for the entire product line. ■

By this time next year, Intel's 586 chip will be the rage. Expect it to come off the line at 66 MHz, running around 50 to 70 mips.

Bursting bubbles.



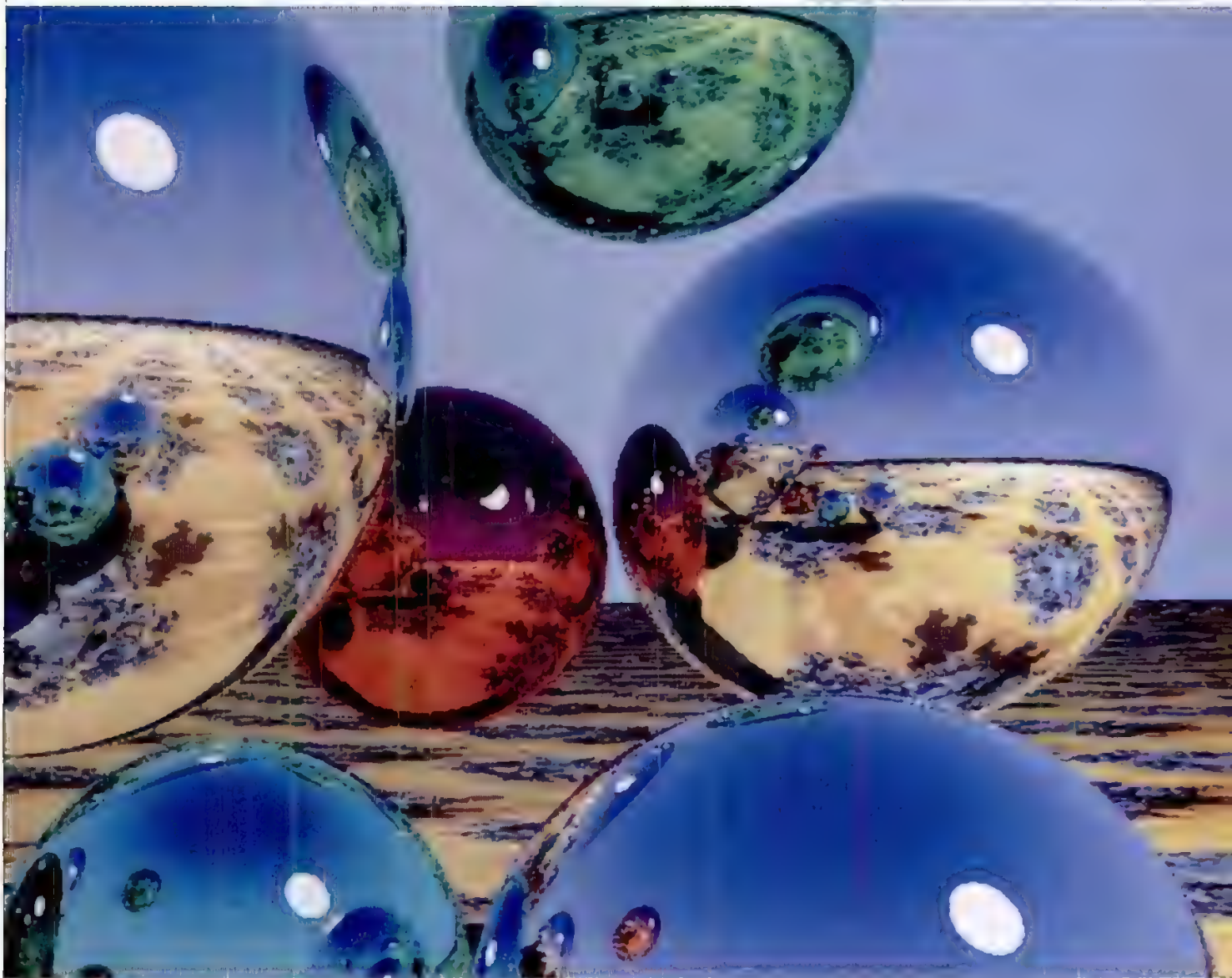
The computer that mad

The bubble in the middle doesn't really exist. It's just an image made from reflections of the sky, of the ground, of the other bubbles.

Only they don't exist either. The whole picture is a mathematical fantasy, and the giant computers that put men on the moon would have struggled to create it.

But an IBM RISC System/6000™ which can sit on your desk, did it easily using RISC technology which was invented by John Cocke, a research scientist at IBM. The RISC System/6000 isn't the only RISC computer, but it is the most advanced thanks to another idea (also Dr. Cocke's) called superscalar technology.

In an historic test at a national research lab, a



e this picture is also making history.

RISC System/6000 was pitted against a Cray® supercomputer for selected applications, and it won. But even more startling, the same lab has since replaced one of its Crays with a network of our smaller machines.

We point this out, not to brag (well, maybe a little), but because the RISC System/6000 is fruit of IBM's huge investment in research, and it shows how our process is changing.

We spend over \$6 billion a year on R&D, and we probably do more pure research than anyone. But lately, our top scientists work more closely with real products, and it helps. For the RISC System/6000, the man who pioneered its basic technology also led it to

market. And the original lab team not only stayed with it, half of them moved from New York to Texas to join the development team.

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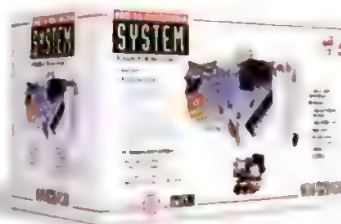
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Jim Seymour



Interface Relics

It's time to let go of some of the quirky holdovers from Microsoft Windows' early graphical user interface designs.

We're seeing a lot of attention paid to interface design and redesign these days. That's driven, of course, by the success of Microsoft Windows, the standard-bearer of the graphical user interface cause. Even resolutely DOS programs, such as *Quattro Pro*, are getting increasingly gooey, with drop-down menus, button bars, and extensive mouse support.

But as we work with graphical interfaces over time, we come to understand that what was once dazzling, and then merely routine, is now often obsolete—a relic of earlier days. What we thought was pretty whizzy and the ultimate answer turns out remarkably often to be only half an answer—much less than the best solution to a problem.

Microsoft has defended the Windows interface conventions with great vigor over the years. Changes were made slowly. While even the sea-change release

of the product, Windows 3.0, looked different, with a three-dimensional effect created by drop shadows and highlighting around boxes, the program still used the same old interface, with the same old conventions, underneath a new facade.

In any graphical interface, it's important to develop a set of logical, internally consistent conventions and then stick to them. That means imposing those conventions on others who develop applications to work under that interface. So Microsoft's zeal in keeping a constant Windows look is in many ways admirable. Otherwise, we'd have forfeited one of the important advantages of Windows: Most Win apps tend to look and work the same way, so we don't have to climb the whole learning curve again and again with each new Windows application we buy.

Sadly, Microsoft's zeal for interface consistency has sometimes gone too far, with the result that some really unfortunate Windows conventions have stayed in place far too long. Defending consistency is one thing; defending mistakes is another.

A good example is Windows' set of "standard" commands for cutting, copying, and pasting: Shift-Del, Ctrl-Ins, and Shift-Ins. Can you explain the logic of those choices? Microsoft couldn't either, but for years it

forced them on developers of Windows applications.

Finally, with the release of Windows 3.1, we've seen a change in Microsoft's position: Now it supports the Ctrl-X, Ctrl-C, and Ctrl-V key combinations, respectively, for those commands. This convention is easier to remember and makes "finger sense"; it feels right on the keyboard, using keys that are close together for one-hand convenience, and follows a logical progression of keys from left to right on the QWERTY keyboard: X, C, and V.

It also appeals to people who have used Macintosh applications, such as *PageMaker*, which later came to the PC under Windows. *PageMaker* has long used those Mac-standard keyboard conventions, but in its Windows version had to change to the goofy Windows Shift-Ins stuff. I'm happy to say, the next release of *PageMaker for Windows* will revert to this older and superior interface convention.

We saw a sneak preview of these revised Windows keyboard conventions in *Word for Windows 2.0*; Microsoft is cleaning up its applications, too, converting to the new Windows standards. Just as subsequent versions of *PageMaker* will adopt the new conventions, new releases of other vendors' Windows applications will, too.

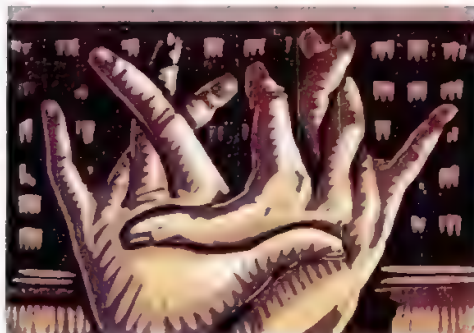


ILLUSTRATION: KRIS WILTSIE

Microsoft people talk about a new "open process" approach at the company, and often cite January's release of the Windows Style Guide and the accompanying User Interface Design Preview held in Redmond. The latter, a conference of third-party Windows applications developers, saw Microsoft inviting outside input on the Windows interface.

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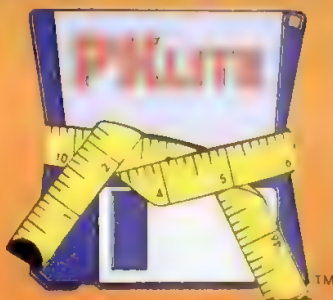
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PC-6/92

Jim Seymour

A new openness to outside advice and Windows 3.1's fit-and-finish cleanups notwithstanding, there's still plenty wrong with the Windows interface. I asked Chris Graham, Microsoft's de facto Windows-interface czar, about some of those conventions, and about how and when we can expect to see them fixed.

Chris is the guy, I should say first, who gets the credit for fixing the cut, copy, and paste convention; send candy and thank-you letters to him at Microsoft, Redmond, Washington.

Some of the remaining clumsiness in the Windows interface will be fixed with the advent of Windows, Version 4.0, which will benefit (in many ways) from object-oriented techniques.

Microsoft will put an end to the odd split between File Manager and Program Manager by combining the two; much greater reliance on drag-and-drop techniques may finally cure most of File Manager's warts. And Win 4 will make much wider use of Browsers to help find files; eventually (but not in 4.0) we'll see Browser-searching extended down to looking for specific words in documents.

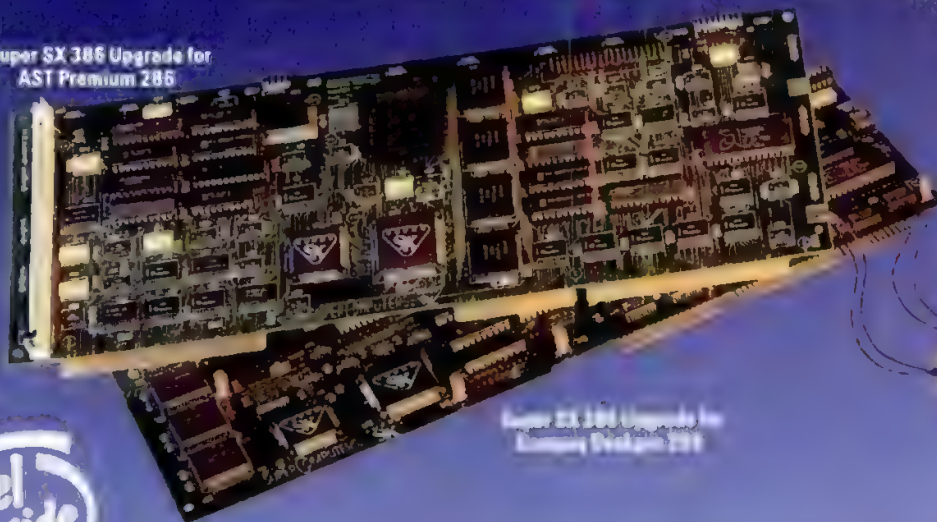
I also hold out some hope that one of the most egregious interface limitations of Windows will be cured. Anyone who has used Mac applications knows how useful it is to have a scrollable list of fonts drop down when you choose Font on an application's menu bar. But Windows isn't that smart: It just extends the alphabetized font list to the bottom of your screen. If there are more fonts available than you can see in a list that long, you're out of luck. The list cuts off at the Ms or the Rs or the Ts—wherever you run out of real estate on the screen.

To get at the rest of the fonts, you have to open the type dialog boxes in the Windows apps and scroll much more slowly through a mingy little list within that box. It's a nuisance. And it's unnecessary.

In my next column, I'll delve more deeply into some of the issues developers confront in cleaning up interfaces. Problems such as mapping an earlier style of working—for example, pointing and clicking or using keyboard shortcuts versus dragging and dropping—don't have easy, self-evident answers. These problems represent intellectual challenges as well as technical ones. ■

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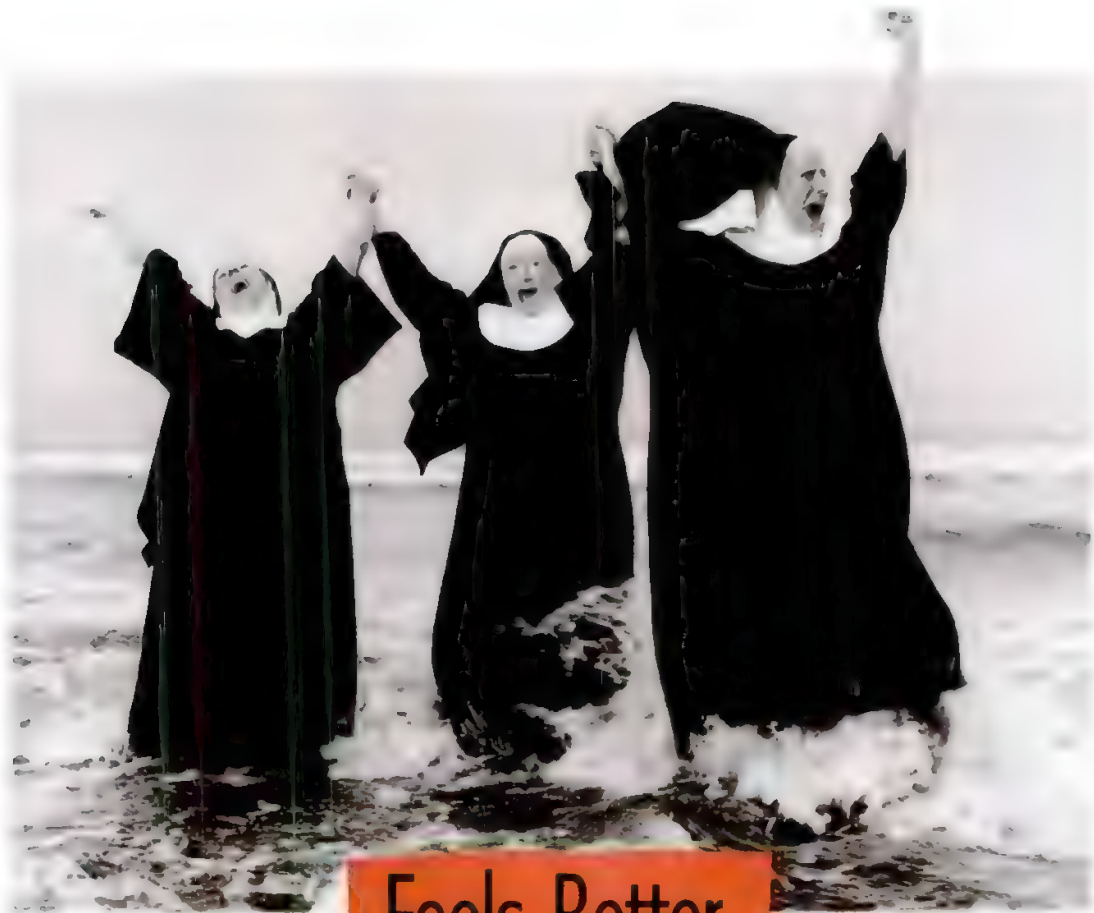


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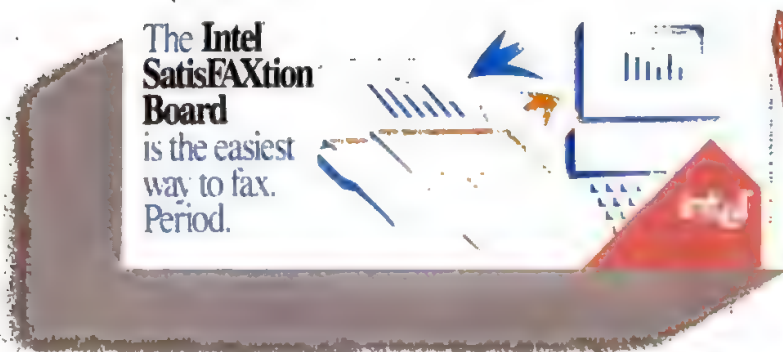
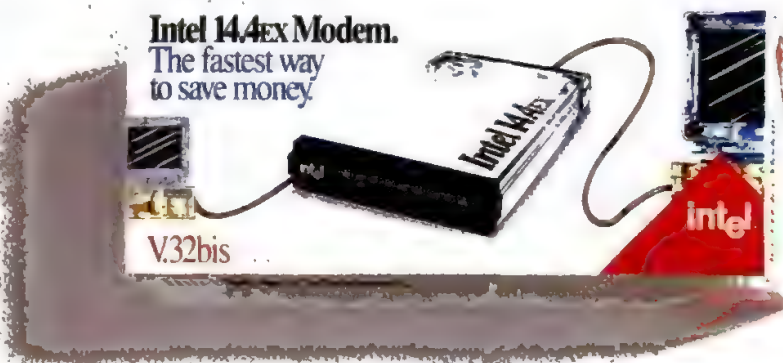


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FIRST...

William F. Zachmann



OS/2's a Winner!

Never afraid to admit he was in error, our columnist claims OS/2 is better poised for success than even he thought possible.

When I did my annual predictions earlier this year (the January 14 issue) in "Prediction 7: Success (finally!) for OS/2" I wrote: "IBM will finally make it with OS/2 2.0 and have a success comparable to Windows 3.0's in its first year."

I confess, I was wrong! OS/2 2.0 will not have success comparable to Windows 3.0's in its first year. It will do much better than that.

I was wrong because of certain assumptions. I assumed OS/2 2.0 would not really ship by the end of March, and that OS/2 2.0 would have lots of problems when it did ship.

I also assumed Microsoft's Windows 3.1 would ship on time and would live up to Microsoft's often-repeated promises for all-but-flawless upward compatibility with existing applications and drivers.

Stupid me, I should know better by now than to believe everything Microsoft says. After all, what promises concerning operating systems has Microsoft kept over the past few years?

The reality is that IBM *did* ship OS/2 2.0 by the end of March. OS/2 is more stable than I'd expected. It is on its way to being the software hit of 1992.

The reality, too, is that Microsoft Windows 3.1 is pretty much a disaster, especially when measured against Microsoft's promises. It has at least as many compatibility problems with Windows 3.0 applications as OS/2 2.0 does.

Sure, Windows 3.1 eliminated the infamous UAE (unrecoverable application error). But now, when your Windows 3.1 application crashes, you get a GPF (general protection fault) and an incomprehensible message about why it crashed. Some improvement!

Worse, the whole system still comes crashing down often enough to be a major pain in the neck. Network stability is still no more than a promise, and printing with the initially shipped version of Windows 3.1 is a mess.

Then too, there are the video drivers that don't work with Windows 3.1. On most systems, you still can't reliably download files or messages at 9,600 bps or faster. And just try to format a floppy disk under Windows 3.1 while you're doing anything else!

To be sure, OS/2 2.0 isn't flawless. High-resolution screen drivers to support seamless

Windows weren't available with the first release. Some hardware wasn't supported, either. OS/2 2.0 has a few compatibility problems with older applications, too.

OS/2 2.0, however, *does* reliably handle networking for LAN- and host-oriented connections. It *does* reliably support asynchronous communications at 9,600 bps or faster in the background. You can format all the floppy disks you want while continuing to use your system.

OS/2 2.0 is even better than I'd expected. Windows 3.1 is much worse. The result will be a more rapid "paradigm shift" from Windows toward OS/2 than I'd dared to expect.

Unless Microsoft delivers an extremely impressive version of the Windows NT beta this summer, with resource requirements no greater than OS/2's, the OS Wars could soon turn into a serious rout for Microsoft. OS/2 will rapidly move from long-shot underdog to odds-on favorite as a DOS replacement, and will become the dominant desktop operating system for the 1990s.

The way things are going, Microsoft Windows is headed the route of the emperor's new clothes in the Hans Christian Andersen story. Perhaps Bill Gates and company should have heeded the warning of the saying, "When God wants to kill an ant, he gives it wings."



ILLUSTRATION KRIS WILTSE

And perhaps the folks at IBM weren't as dumb as they looked after all. Perhaps they remembered the advice of the ancient Chinese General Sun Tzu, who wrote in his book *The Art of War*: "Pretend inferiority and encourage his arrogance." Maybe that's why news from the battlefield increasingly favors OS/2. ■

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CIRCLE 118 ON READER SERVICE CARD

CIRCLE 118 ON READER SERVICE CARD

17-INCH DISPLAYS

A Better View of Windows

IN THIS REVIEW

- AcerView 76
- American Mitac M1758
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- Epson Professional Series
- HP Ultra VGA 17-Inch Display
- Idek/Iiyama MF-5317
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- Nanao Flexscan F550i
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- Relisys RE1776 17-Inch High Resolution Multiscan Color Monitor
- Seiko CM1760LR
- Sony CPD-1604S 17" Multiscan Trinitron Color Computer Monitor
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by Oliver Rist

For only a little over \$1,000 street price, you can upgrade your system to accommodate Windows better with one of these 16 17-inch monitors. They offer more display room, high-quality images, and a host of features, including antiglare screens, a variety of image controls, BNC connections, and the ability to store multiple settings.

You've installed Microsoft Windows 3.1 and added more RAM, a faster processor, a graphics accelerator, and a larger hard disk to really make it scream. But still you're not satisfied. As you look at the crowd of application icons and overlapping program windows winking back at you from your 14-inch CRT, the answer becomes clear: You need a larger screen.

A 17-inch monitor can provide from 45 to 60 percent more viewing area than a 14-inch monitor, so you can have more applications on-screen at the same time. Keep in mind that all monitors are measured diagonally between tube corners; that is the specification manufacturers use when discussing the size of their unit. All the monitors in this review have a 17-inch tube, but the actual diagonal image display area is usually 16 inches or a little less, just as the actual diagonal image display measurement of 14-inch CRTs is around 13 inches. Of the 16 17-inch monitors reviewed here, the systems from Epson America, Idek/Iiyama North America, Seiko Instruments USA, and

Sony Computer Peripheral Products Co. offered larger diagonal image display measurements, with Seiko having the largest at 16.5 inches.

The 17-inch screens in this review are also meant for higher resolutions. Going from 640-by-480 to 800-by-600 resolution on your 14-inch screen results in denser pixels—that means smoother screen fonts. But the characters will be smaller and harder to see. On a 17-inch screen, 800-by-600 still means denser pixels than 640-by-480, but since they are bigger pixels, characters are both smooth and easier to see.

The end result is a more aesthetically pleasing and ergonomically sound display. You can run a 17-inch display in 800-by-600 mode and have characters that appear about the same size as 640-by-480 characters on a 14-inch screen. In 1,024-by-768 mode on a 17-inch CRT, characters will appear about the same size as 800-by-600 characters on a 14-inch screen.

SETTING A STANDARD

With the obvious advantages of larger screens for graphical user interface (GUI) applications and the increasing use of Windows in the workplace, monitor makers are positioning the 17-inch display as the new corporate standard. They are touting improved ergonomics, more image controls (many of them digital), microprocessor-enhanced autosizing, and other features to attract the corporate buyer in a difficult economy.

Surprisingly, this has not caught on with many systems vendors. Although there have been moves made by PC sellers toward larger displays—Gateway, for instance, now markets 15-inch monitors as standard with its high-end systems—packaged configurations with 16- or 17-inch screens are more rare. Among the few companies that can provide this option are Northgate Computer Systems and Zeos International, which can bundle the NEC MultiSync 5FG with their high-end CPUs, and Dell Computer Corp., which offers the Graphics Performance Display 16C we reviewed last year. Compaq Computer Corp. and Everex Systems will offer their new 17-inch monitors as options with their high-end systems, as well. If you are buying a PC system, be sure to ask the vendor if it can bundle a mid-size monitor for you. The price difference between a 15-inch monitor to a 17-inch display is only around

\$500 on average (list price), and this will probably decrease on the street and certainly as part of a package deal.

Why target the 17-inch display and not 20- or 21-inch displays for the corporate desktop? The answer is mainly a matter of money and space. A 20-inch or 21-inch display is considerably bigger than a 17-inch (about 4 to 8 inches deeper), not to mention heavier. While the 17-inch systems we review were already hefty entries, weighing between 40 and 60 pounds, 20-inch and bigger units can weigh up to 80 pounds or more. For example, the \$3,499 21-inch NEC MultiSync 6FG is 22.4 inches deep, versus the 19.8-inch depth of the 17-inch \$1,699 NEC MultiSync 5FG. The NEC MultiSync 6FG also weighs 79 pounds, compared with the 56-pound MultiSync 5FG.

Generally, 20- or 21-inch monitors cost between \$2,000 and \$4,000, compared with the \$1,500 to \$1,600 list price of most of the 17-inch monitors reviewed here. The larger the tube size, the more difficult it is to accurately control the electron guns; the engineering cost

and higher-quality components required to accomplish this adds considerably to the price of 20-inch monitors. There is certainly a market for these systems, but it is primarily limited to CAD or CAM users who require the larger display area and others wishing to work under 1,280-by-1,024 resolution. Although some of the units reviewed here can handle that mode, most users will find the image too small.

Even if you likely will not work in 1,280-by-1,024 mode with these 17-inch monitors, it is interesting to note that having that capacity does not necessarily add to cost, nor does doing without it always keep the price down. While it is true that the least expensive monitors we reviewed—the \$999 American Mitac M1758 and the \$1,099 AcerView 76—do not offer 1,280-by-1,024 resolution, neither does the \$1,539 Epson Professional Series or the \$1,789.95 Sony CPD-1604S 17" Multiscan Trinitron Color Computer Monitor. Conversely, the less expensive

\$1,399 displays from Seiko and ViewSonic do provide the higher resolution.

HOW TO BUY

Although competitively priced, 17-inch displays are not cheap, so consider carefully the features you will need when making your investment. A primary consideration is to make sure your monitor can sync to a variety of video modes, especially the higher-end ones such as Super VGA and 1,024-by-768. Beware of manufacturers' terminologies, though: A monitor simply labeled "multiple-frequency" might mean that it is capable of merely digesting a limited number of fixed-frequency combinations. (On our features table, we refer to these monitors as fixed-frequency multiscan displays.)

You want a variable-frequency multiscanning monitor (although *multisync* is sometimes used in place of *multiscan*, the

word *MultiSync* is actually trademarked by NEC). A variable-frequency multi-scanning monitor can handle any combination of sync signals that falls within its defined bandwidth. A sync-signal combination is composed of a horizontal and a vertical scanning frequency.

You want variable-frequency multiscanning because the more frequency combinations the monitor supports, the more video cards it can work with and the more resolution modes it can offer.

Monitors and graphics adapters speak to each other mainly in terms of frequencies. The graphics card sends out the horizontal and vertical sync signals to the display. A monitor's electron guns draw screen pictures one horizontal line at a time, from left to right. The guns must make several hundred horizontal passes for every frame. The number of frames the monitor draws per second is called the frame rate, vertical refresh rate, or vertical scanning frequency. Since many horizontal cycles must be completed before even one vertical cycle is done, horizontal frequency is described in kilohertz (kHz), while vertical frequency is expressed in hertz (Hz).

Ever since monitor ergonomics became popularized by the media, VESA

Why a 17-inch CRT

for the corporate desk?

It's mainly a matter of money and space.

(Video Electronics Standards Association) has been coming out with minimally acceptable and recommended monitor vertical refresh rates. The slower the monitor redraws the screen, the more flicker your eyes will perceive. A high refresh rate will ensure flicker-free images on your screen (especially desirable in a multicolored Windows environment) and ease eyestrain. For 640-by-480 and 800-by-600 resolutions, VESA has standardized on a 72-Hz refresh rate, while for 1,024-by-768, it standardizes on 70 Hz. VESA also says that in Super VGA and 1,024-by-768 modes some people are unaffected by flicker at 60 Hz. It maintains this refresh rate only as a minimum guideline, though.

A monitor with a 50- to 75-Hz vertical and 30- to 50-kHz horizontal scanning frequency provides a comfortable range for today. But if you are buying with an eye toward tomorrow, look for a monitor with scanning frequencies in the range of 50- to 100-Hz vertical and 30- to 75-kHz horizontal. The higher the frequency your monitor can accept, the better equipped it will be in case higher ergonomic refresh rates should be recommended, for instance. (The NEC Multi-Sync 5FG, for example, offers a 55- to 90-Hz vertical scanning frequency and a 27- to 79-kHz horizontal scanning frequency; it can handle 1,280-by-1,024 resolution at a 74-Hz refresh rate.) And don't forget to verify that your video adapter can produce these high frequencies, too. If not, you may have to upgrade.

DOT PITCH

Want to do detail work at high-end resolutions? Look for a fine dot pitch. A monitor's dot pitch is representative of how far apart the individual holes are in its shadow mask (a fine grill that guides the electron beams to ignite individual phosphors on the screen). The larger the dot pitch, the less precise the electron beams will be and the more grainy an image you will get, especially if you increase the number of pixels on-screen with high-resolution modes. To run Super VGA resolution or better, a 0.31-millimeter dot pitch is an absolute minimum and a 0.28 mm is recommended. There are monitors in this review with even smaller dot pitches (the units from Epson, MAG, and Tatung have 0.26-mm dot pitches); the smaller the better.

If the monitor you are looking at runs on a Sony Trinitron picture tube, it will not have a dot pitch per se. The Trinitron

does not use a shadow mask; instead, it employs something called a *stripe mask*, or *aperture grill*. This serves the same function as a shadow mask, but it is constructed with thin wires that run only the length of the screen, not the width, thus creating stripes rather than holes. A Trinitron tube's aperture grill measures the space between these stripes and is sometimes mistakenly referred to as the dot

pitch. Two of the units we saw that used Trinitron technology—the Sony CPD-1604S and the Seiko CM1760LR—boasted admirably small aperture grill pitches of 0.25 mm. The other Trinitron-based system in this review, from Mitsubishi, offered a very good 0.26-mm aperture grill pitch.

Trinitron tubes are flat in the vertical and curved on the horizontal, while true flat tubes (like the famous \$869 14" ZCM-1492 from Zenith Data Systems) are flat

HIGHLIGHTS

■ A 17-inch monitor can provide from 45 to 60 percent more viewing area than a 14-inch monitor. This enhances productivity by allowing you to have more Microsoft Windows applications open on-screen at one time.

■ At the same resolutions, pixels are bigger and easier to see on a 17-inch display than on a 14-inch cathode ray tube. Characters viewed at 1,024-by-768 resolution on a 17-inch monitor appear as large as characters viewed at 800-by-600 on a 14-inch system. Stepping down to 800-by-600 on a 17-inch display produces a viewing solution that is even more ergonomically sound.

■ The 17-inch monitors we review cost, on the average, about \$1,500 to \$1,600 list price. That is about \$500 more than the cost of a 15-inch unit, but can be as much as \$2,500 *less* than the price of a 20- or 21-inch display.

■ When making your selection, look for a monitor that offers variable frequency multiscanning, not fixed frequency multiscanning. The more frequency combinations a monitor supports, the more video cards it can work with and the more resolutions it can offer.

■ All of the monitors reviewed here can handle the VESA-recommended vertical refresh rates of 70 Hz at 1,024-by-768 resolution and 72 Hz at 800-by-600 resolution. Some products support even higher vertical refresh rates at those resolutions.

■ If you want to do detail work at high-

end resolutions, you should be sure to investigate your monitor's dot pitch (or aperture grill pitch, if it uses a Trinitron tube). To run Super VGA resolution or better, a 0.31-mm dot pitch is an absolute minimum, and a 0.28-mm dot pitch is recommended. Some of the monitors reviewed here provide even finer dot pitches or aperture grill pitches of 0.25 mm (the Seiko CM1760LR and the Sony CPD-1604S) or 0.26 mm (the Epson Professional Series, the Mitsubishi Diamond Pro 17, the Relisys RE1776, and the Tatung CM-17MBD).

■ The 17-inch displays reviewed here offer a wide variety of user controls. These range from the expected controls for brightness and contrast to those for image size and positioning to more exotic options for adjusting pincushioning and even convergence. The displays from Mitsubishi and NEC are further distinguished by offering color-matching controls.

■ All of the units except for those from American Mitac, Idek/Iiyama, Relisys, Seiko, and Sony come with factory-preset image settings for the most popular resolutions and give users the ability to modify those settings or add new ones.

■ In addition to easing eyestrain simply by virtue of their larger size, most of these products add further protective measures as standard features, such as silica-coated antiglare screens. Others, such as the NEC MultiSync 5FG, offer optional lenses to perform the same function. ■

on all sides, and the newer flat-square tubes have only minor curves. In contrast, most older CRTs are based on a curved screen area, a setup that allows the electron guns to easily maintain a perpendicular targeting area at all points on the screen. Flat-square screen technology is popular in the 17-inch market: 13 products in this review use it.

Although flat-square screen technology has a reputation for better picture quality, both it and true-flat tube technology have also caused a few problems. With a curved screen, there are more areas to physically attach the shadow mask to the CRT before vacuuming; flat-square and true-flat screen tubes are limited to only four. This can cause the shadow mask to break easily or just fall off—especially if it is made of the newly popular and heavier Invar material. (Invar is a new metal alloy that is especially good at not expanding under heat.) In addition, a flat-screen monitor requires additional circuitry for controlling the electron guns. These can no longer count on an entirely perpendicular target area when igniting phosphors, especially when shooting at the corners: What was once 90 degrees might now be only 75. Unaltered, this would result in oval pixels instead of round ones and so requires compensating circuits.

All this has led to lower yields in tube factories and higher prices. For you, it means making sure your warranty card is sent in and that you thoroughly test your monitor as soon as you get it (most graphics adapters and PC system disks include some kind of monitor testing routine). Look for image anomalies such as shoddy focus, which may indicate that the electron guns—now more delicate than ever—were damaged during shipping.

CONTROLS AND FEATURES

Earlier monitors were limited in the scope, implementations, and location of their image controls (some still are). Monitor manufacturers sometimes provided no image controls—only contrast, brightness, and power, and these inconveniently located somewhere near the back of the unit. When there were image controls, they were generally restricted to analog horizontal and vertical size and positioning. Manufacturers are wising up.

The new 17-inch breed reviewed here are the most feature-rich mainstream monitors to date. All sport brightness, contrast, and the four basic image controls

(horizontal size, vertical size, horizontal positioning, and vertical positioning). On many monitors, these controls are now arrayed on the front panel, instead of being mounted awkwardly on the rear underside of the case. For the most part, they have also evolved from analog (knobs) to digital (keys), which are easier to use and more accurate.

A number of the monitors reviewed here also provide internal microprocessors and memory. Using this technology, the products from Acer America, CTX, HP, MAG, Mitsubishi, Nanao, Tatung, Toshiba, and ViewSonic are able to store a number of image settings for a variety of graphics display modes. Many manufacturers call this feature *autosizing*, but true autosizing means that the monitor can maintain a constant image size no matter what resolution the graphics adapter dictates. Currently, this technology is generally unavailable because even within the stringent VESA timing standards there is room to maneuver: Not all graphics cards or accelerators speak VGA, Super VGA, or 1,024-by-768 modes the same way. Though possible, true autosizing remains an extremely expensive feature, one not considered very cost-effective by both vendors and users.

Conscientious monitor makers have done the next best thing. Displays are preprogrammed with a number of image settings for the most popular (as the manufacturer interprets them) resolutions. If your graphics card speaks one of these popular modes, the monitor will switch to that setting automatically and display a nearly perfectly sized and positioned image. If not, the monitor usually has blank memory slots into which you can program your own settings or reprogram the factory presets. Play with the controls once until the image is perfect, save it, and you never have to meddle with it again.

The units from NEC and Mitsubishi arrived with yet another feature other manufacturers will doubtless emulate—color matching. (Nanao already has plans to add color matching at no extra cost to the next incarnation of the Flexscan F550i we review here.) These systems were prompted by an upturn in color printing popularity and subsequent complaints by users that the colors displayed on their monitors were not the same as the ones printed. See the sidebar “Matching Color at Gunpoint” for a complete discussion of

this technology (and its limits), but briefly, the feature allows you to use digital controls to adjust the strength of the red, green, and blue electron beams so screen colors more closely match printed colors.

Manufacturers such as Acer, Epson, Mitsubishi, Nanao, NEC, Tatung, and Toshiba have added pincushioning controls to their displays. The Mitsubishi Diamond Pro 17 even offers adjustable convergence. If your monitor has a pincushioning problem, it is seen as an inward or outward bowing of the image along the screen's edges, a kind of hourglass effect (outward bowing is also called *barrel distortion*). Almost every monitor of any size exhibits some degree of pincushioning, and pincushioning controls can help in fine-tuning the image. Convergence is the measure of how well the monitor's red, blue, and green electron guns produce clean, crisp colors (especially white). To do this well, the beams must overlap each other precisely. Inaccuracy results in bleeding—colored halos around images. A convergence control would allow you to alter the alignment of the guns for the best possible screen color.

CONNECTIONS, CONNECTIONS, CONNECTIONS

Of course, 17-inch screens are expected to provide maximum performance—crisp colors and high bandwidth. To this end, many monitors (ten of the products reviewed here) offer BNC connections, as well as the cheaper standard DB-9 or miniDB-15 ports.

BNC connectors split the PC's video signals into three to five separate cables. The choices are: a wire each for red and blue and another wire for green and a combined sync signal (three wires), a wire for each color and one for the combined sync signal (four wires), or separate wires for each color and additional wires for the horizontal and vertical components of the sync signal (five wires). Coaxial BNC connectors offer the highest available RGB picture quality and a maximum of flexibility for accepting signals from different sources.

ERGONOMIC CONSIDERATIONS

After making sure your monitor is properly suited for your computer, applications, and graphics adapter, make sure it's ergonomically suited for you.

The easiest and most common way to reduce the eye fatigue that can result from staring at a screen all day is with antiglare

CRT RADIATION: A Glowing Concern?

Is all the concern about monitor emissions merely the result of hype, or do emissions present a real hazard to your health?

by Alfred Poor

Just what is the truth behind the questions about monitor emissions and their impact on health? Are they responsible for elevated cancer rates, eye stress, abnormal pregnancies, and increased miscarriages among computer users?

The fact is simply that the facts aren't clear. Monitors emit some radiation of all sorts: If they didn't, we would not use them, since the light that they emit is a central feature. The emissions associated with monitors are straightforward electromagnetic emissions, similar to the radio waves used for telecommunications. These emissions are not produced only by radio stations and monitors, either; they come from fluorescent lights, electric blankets, and even toaster ovens. But monitors do not emit *ionizing* radiation, which is the unquestionably hazardous and potentially carcinogenic sort associated with X rays and radioactive materials.

The emissions from computer monitors that have gained attention fall into two categories: VLF (very low frequency) ranging from 2 kHz to 400 kHz, and ELF (extremely low frequency) from 5 Hz to 2,000 Hz. In higher frequency emissions than these, the electrical and magnetic components of the emissions can be more or less treated as a single unit, but at these low frequencies the two parts behave quite differently. At the higher radio frequencies, for example, the magnetic and electrical components behave nearly identically; they are blocked by the same physical barriers (radio stations fade when you drive under a bridge, for instance). That is not the case with moni-

tor emissions: A single barrier may block the electrical component, for example, but not the magnetic.

Although there have been some studies that raise questions about the possible health hazards posed by VLF and ELF emissions (particularly associated with power transmission lines), there have not been any definitive studies that prove a connection between monitor emissions and particular health problems. An article printed in the July 1, 1991, issue of *Health Physics* summarizes a range of epidemiological and laboratory studies and concludes that there is no basis for linking monitor emissions with adverse health effects for pregnant users.

THE MAKING OF AN ISSUE

Just because no link has been established between monitor emissions and health problems does not mean that there is no risk, and there are many studies underway to further explore this area. But if there is no evidence that monitor emissions are a problem, why did this become an issue in the first place?

One of the central focal points has to be the standards set by the Swedish National Board for Measurement and Testing. In general, workplace health concerns have been an issue in Europe longer than they have in the United States (for example, European users had special amber phosphors for monochrome screens that were supposed to be ergonomically better, back when most Americans were still using green phosphor screens). It is not surprising that the emissions debate was first raised in Europe. The first Swedish set of standards—referred to as MPR—were set in 1987 and made recommendations regarding only the electrical component of VLF emissions. Last summer, a more stringent standard was adopted that covers the levels of magnetic and electrical fields in both the VLF and ELF ranges—the MPR II standard. One interesting aspect of both standards is that no one really knows whether or not the recommended MPR or MPR II electromagnetic radiation levels are themselves

safe, since no scientific studies have proven which levels should be permitted. These standards may be unnecessarily restrictive or possibly not restrictive enough.

A law passed in San Francisco last year, which required ergonomic workstations and frequent breaks for monitor users, added to users' concerns about potential health hazards from monitor emissions. But in point of fact, low emissions were not even part of that ordinance. (The law was subsequently struck down this spring.)

Of course, the media has done its share of playing up the potential health hazards, without always being careful to mention the lack of documented risk.

TAKING THEIR MEASURE

Even if there was concrete evidence dictating what levels of ELF and VLF emissions are safe, the truth is that emissions vary under different conditions and are not evenly distributed in all directions. The MPR standards, for instance, require that precise measurements be taken in 48 different locations around the monitor.

Evaluating monitor emissions can be extremely difficult, however, and reliable results are hard to obtain. To begin with, you need to create a sophisticated testing area that screens out background emissions. Since the magnetic and electrical fields surrounding a monitor can vary a great deal from one point to another, especially as you move slightly closer to or farther away from the monitor, precise placement of the measuring device is essential, but difficult to repeat. In addition, the actual image displayed can have an impact on the emissions, so that a given set of measurements may not predict the emissions a user would actually encounter.

RESPONDING TO THE CONCERNS

Despite the questions regarding truly safe levels of emissions and the difficulties in testing for them, companies are feeling the pressure to provide low-emissions designs. Some

CONTINUES

CRT RADIATION

CONTINUED

models simply conform to the older MPR standards, while more-recent designs meet the more-stringent MPR II requirements. Of the products in this review, nine claim to be low-emissions models, and all but one conform to the MPR II standard. There are many aftermarket products available as well, such as special grounded glare screens, but these typically reduce only the electrical fields. Reducing the magnetic fields usually requires changes to the design within the monitor's case.

While the jury is still out on the issue of ELF and VLF emissions from monitors, what should you do? Certainly, you can purchase a low-emissions monitor next time you need a new screen and pay no more than you would for a traditional model. In fact, many vendors have begun quietly providing low-emissions monitors as their standard products. In such a litigious society, it is little wonder that some companies are concerned about potential product liability suits if it should be proven that older designs do harbor a health hazard.

If you plan to hold onto your existing tubes, however, you can start by sitting at least 2 feet away from the screen. Not only will this reduce your exposure to ELF and VLF emissions (since they dissipate at a rate that is the square of the distance), but it may also help reduce eyestrain as well. And stay at least 3 or 4 feet away from the back of your neighbor's monitor, since most CRTs give off more emissions from the rear. Finally, turn off your monitor when you are not using it.

Keep this all in perspective, however. Do not spend so much time worrying about possible risks from monitors that you ignore other factors that are known to pose potential hazards. So, while you sit a bit farther from your screen, remember to quit smoking, watch your weight, check your blood pressure, and exercise regularly. ■

measures. Generally, these come in the form of an etched screen or some kind of silicon-based antiglare coating over the monitor's screen surface. But be aware that such antiglare measures, though they reduce the strain on your eyes, take a toll on color brightness. The NEC MultiSync 5FG is the only monitor in this roundup that provides no standard antiglare treatment, but NEC does offer a choice of two \$119 optional antiglare lenses. In its standard configuration, the NEC monitor may prove annoying under fluorescent lighting, but it also produced some of the brightest, clearest colors we saw.

You should also consider ELF and VLF radiation emissions (see the sidebar "CRT Radiation: A Glowing Concern?"). Although no conclusive results have ever been presented to either condemn or acquit ELF and VLF radiation, many monitor manufacturers have decided that it is good business to conform to the MPR or MPR II monitor emissions standards set by the Swedish National Board for Measurement and Testing. Among the products reviewed here that claim adherence to one or the other of these standards are the HP Ultra VGA 17-Inch Display, Idek/Iiyama MF-5317, Mitsubishi Diamond Pro 17, Nanao Flexscan F550i, NEC MultiSync 5FG, Seiko CM1760LR, Sony CPD-1604S, and the ViewSonic 7.

Aside from ergonomics, the question of whether you can use the display at home may be important to you. Not all the systems reviewed here are FCC Class B certified; those that are include the units from American Mitac, CTX, Epson, HP, MAG Innovision, Relisys, Sony, Tatung, and ViewSonic.

TESTING THE DISPLAYS

We used the Microvision Superspot 100 to chart the monitors' performance in a variety of areas, including Horizontal and Vertical Pincushioning. PC Magazine Labs recommends that a monitor's horizontal and vertical pincushioning scores be no greater than twice its respective horizontal or vertical line width score. We also measure Vertical-Line Convergence; convergence problems tend to show up in corners. Line Width Variance defines how square a pixel is by showing the proportion of its width to its height (on Trinitron monitors, pixels are generally longer than they are wide). We also assess each monitor's Swim Ratio by measuring long-

term beam motion over a 30-second period. The object of this test is to determine a monitor's image stability.

It is important to understand a few things about our tests with the Superspot 100. The first is that monitor performance varies among units from the same manufacturer and even within the same model. Secondly, the Superspot is sensitive enough to pick up slight flaws that will not necessarily be noticeable by the naked eye. Additionally, each test focuses only on specific areas of the screen, though we have picked the areas where problems are most likely to show up—for example, one inch from the upper-left corner and one inch from the lower-right corner for all but the Pincushioning tests. The results of our subjective testing, which consist of bandwidth tests (these look for elements like blooming, color shifts, and muddy characters) and replications of the Superspot 100 procedures using only the human eye, are discussed in the reviews. These should be given due consideration when making your purchasing decisions.

REVIEW CRITERIA

For this review, we required products to be 17-inch color monitors that offered at least 1,024-by-768 resolution and were compliant with the VESA refresh standards of 72 Hz at 800-by-600, and 70 Hz at 1,024-by-768. We also required that the products be shipping in the U.S. in reasonable quantities to end users by our testing start date. If the company offered multiple 17-inch products that fit our filter, we asked it to send what it considered to be its best Windows performer priced under \$2,000 (about the upper limit most users will want to spend for a monitor of this size). We also did not look at any systems reviewed in "16-Inch Monitors: Sized for Super VGA" (*PC Magazine*, March 26, 1991) that had not been upgraded since that evaluation.

Considering the amount of industry excitement surrounding these new mainstream monsters, surprisingly few companies made it into our roundup. Low factory yields may hold the chief blame; unable to acquire enough tubes, many manufacturers may have been forced to extend their ship dates. This time around, 16 17-inch displays arrived for testing at PC Labs, including the AcerView 76, the American Mitac M1758, the CTX-1760, the Epson Professional Series, the HP Ultra VGA 17-Inch Display, the Idek/Iiyama MF-5317, the MAG MX17F, the

The Pros Rate CA-SuperCalc Higher Than Lotus 1-2-3 And Microsoft Excel.

innovative that you work in an environment." Says Loden, president of Microsoft reseller Loden Associates, "CA-SuperCalc has built-in defaults." Computer Associates and Lotus Products, say

VARBUSINESS Spreadsheet Report Card			
	CA-SuperCalc	Lotus 1-2-3	Microsoft Excel
Ease of use	7.30	6.50	7.11
Memory Requirement	7.00	5.41	6.14
Ease of programming	6.48	5.86	6.26
Ability to manipulate data	7.31	6.71	7.00
Sorting capabilities	7.50	6.64	6.68
Provision for software security	6.96	5.25	5.10
Report writing capabilities	6.78	5.33	6.17
Ease of use of interface	7.45	6.19	6.77
Software integration capabilities	7.30	6.23	6.78
Ease of data retrieval	7.50	6.78	7.00
Satisfaction with product profitability	6.81	5.75	6.42
Overall quality of product	7.70	7.18	7.53
Provision for customer support	7.52	5.79	6.22
Charges for training time	6.43	5.60	5.71
Provision for technical support	7.34	5.55	5.95
Provision for marketing support	6.69	5.71	5.93
Documentation & product information	6.90	6.70	6.98
Frequency of updates & revisions	6.59	5.75	6.15
OVERALL AVERAGE	7.09	6.05	6.44

Recently, VARBUSINESS conducted a survey of some people who know more about spreadsheets than anyone.

The people who sell, install, and support them for a living. The survey asked hundreds of spreadsheet dealers and



CA's Computing Architecture For The 90s

resellers all kinds of questions to find out what the pros rate as the best spreadsheet. And the pros told them.

CA-SuperCalc.®

In virtually every category from ease-of-use to technical support,

CA-SuperCalc was rated higher than Lotus® 1-2-3® and Microsoft® Excel.

We're not surprised. While Lotus and Microsoft have been fussing over their many different spread-

sheet versions, we've been stuffing one spreadsheet, CA-SuperCalc, with everything you would ever want. From spreadsheet linking to 3-D graphics and beautiful, presentation-quality output,

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Even I, Mr. Magoo, Can See The Advantages Of This New 17" Color Monitor.

According to Mr. Magoo, most monitors are little bitty things. Can't see 'em at all.

But Samtron's newest color monitor is an eye-opening 17" (13.6" wide, 10.22" high). Enough screen even for his feeble vision. Which also makes it just the thing for you, if you want to peer at lots of Windows™ Or spreadsheets. Or pages of text.

Finer .26mm Dot Pitch.

The screen is not only bigger, its dot pitch is smaller. Honed to a fine 0.26mm. Together with 1,024 x 768 resolution, that means

a far sharper picture. More visible details. With less flickering edges where colors meet. Those are things any CAD operator can appreciate.

What's more, it's built with Samtron's non-interlaced, flicker free technology. Truly a sight for sore eyes.

Flat-Screen Technology.

Magoo also likes the fact that the screen is flat. And the corners square. So there's less distortion near the





1. We've moved the dots that make up color pictures closer together. Result: crisper edges, finer details.
2. Our smaller dot pitch lessens jaggedness and fluttering where two different colors come together. Cuts eyestrain, especially over long periods of time.
3. Without Samtron's finer details, letters fill in, sharp corners become rounded. Small type loses legibility as on right.
4. Designed to use minimal desk space.

edges, more of the screen that's usable. Its tilt-and-swivel base moves easily with one hand, stops solidly for the best viewing angle.

Big Screen, Small Size.

Amazingly, this much monitor comes in a very small package. Only 16" high by 16.8" deep by 16" wide. Takes up little more desk space than a bread box. Thoughtfully, all its screen-adjustment controls are in front, where the viewer is. And with Samtron's automatic degaussing coil,

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There's no worry about emissions, either, with our VLMF (Very Low Magnetic Field) model. It's classified by Sweden as meeting MPR II standards.

Two more advantages are our VGA and VESA compatibility. Which mean it fits in with IBM standards as well as accepting all other standard graphics cards.

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EDITORS' CHOICE

- MAG MX17F
- Nanao Flexscan F550i

To get the most out of Microsoft Windows, you need a fast processor, lots of RAM, a big hard disk, a graphics accelerator board, and a larger screen. A 14-inch display is not going to be adequate when you need multiple Windows applications on-screen at the same time. A 17-inch monitor provides 45 to 60 percent more viewing area than its 14-inch counterpart, and that translates into increased productivity. A bigger screen is also more ergonomically sound: Characters on a 17-inch display in 1,024-by-768 resolution appear about as large as those viewed at 800-by-600 (Super VGA) resolution on a 14-inch CRT. Moving down a notch to work in Super VGA mode on a 17-inch display is even easier on the eyes.

In this roundup, we tested 16 monitors with 17-inch screens. All but two offer acceptable image quality or better, and two products stand out among the rest as Editors' Choice winners: MAG Innovision's \$1,549 MAG MX17F and Nanao USA Corp.'s \$1,749 Nanao Flexscan F550i.

An excellent price, a high-quality image, welcome extras like an LCD indicator of resolution and refresh rate, and the ability to use a miniDB-15 connector as a video pass-through to a second monitor all help to clinch an Editors' Choice award for the MAG MX17F. The unit we reviewed boasted the best Vertical Pincushioning measurements we saw, and its fine 0.26-millimeter dot pitch and 125-MHz video bandwidth contributed to an on-screen image that was sharp enough to slice a steak.

We noted some slight convergence problems, but these are simply not visible at normal viewing distances. An antiglare

silica-coated screen, FCC Class B certification, and the ability to store image settings in memory add to the unit's attractions.

In a market where the average list price of a unit is \$1,500 to \$1,600, the Nanao Flexscan F550i comes in at a somewhat higher cost—\$1,749. But for your money, you get a system with excellent beam focus (attested to by the monitor's remarkably narrow measured Horizontal and Vertical Line Widths) and even intensity and brightness extending out to the corners of the image.

Nanao USA Corp. chose not to sacrifice accuracy for brightness in its design: Though the image is dimmer than many competitors, the Flexscan F550i's excellent transient response is proof of its accuracy. Like the MAG MX17F, the Flexscan F550i offers the ability to store image settings in memory and a silica-coated antiglare screen, and it adds compliance with the MPR II monitor emissions standards. At 0.28 mm, the Flexscan F550i's dot pitch is slightly less fine than the MAG MX17F's, but you wouldn't know it from the sharpness of the image.

RUNNERS-UP

Honorable mention goes to two players—the NEC MultiSync 5FG and the ViewSonic 7.

The \$1,699 NEC MultiSync 5FG provides a number of noteworthy features—from external extras, like the cleanly designed back and sleek Frogdesign chassis, to internal goodies, like the AccuColor color-matching feature. It also offers the ability to store settings and display images in 1,280-by-1,024 mode at a remarkably ergonomic 74 Hz. The MultiSync 5FG delivers even brightness and clean lines out to the edges of the display. Its polished

glass screen provides one of the brightest images of the group, but it also leads to a considerable amount of glare. The only way to avoid this is to purchase one of NEC's two \$119 glare-reducing lenses. But that brings the list price of the monitor to \$1,818, the second-highest price among all of the units reviewed. Additionally, compared with the diagonal image display measurements of the MAG MX17F and the Flexscan F550i—15.5 inches and 15.8 inches, respectively—the NEC monitor's 15.3-inch diagonal viewing area comes up a little short, especially since the unit is bulkier than most.

The ViewSonic 7 deserves mention because it manages to marry a low \$1,399 price with a good features set and an above-average image. With a full 16-inch diagonal image display measurement, antiglare coating, an impressive 110-MHz bandwidth, 0.28-mm dot pitch, and FCC Class B certification, the ViewSonic 7 has plenty of features to recommend it.

The only monitors from this roundup we have real reservations about recommending are the American Mitac M1758 and the Idek/Iiyama MF-5317. The performance of these two units fell below the rest of the group. The best feature the M1758 has is its \$999 price, but that is countered by a sparse features set and an image that was marred by an ugly blue band running down the left length of the screen in all video modes. The \$1,495 Idek/Iiyama MF-5317 suffered from some serious image positioning problems and a visible area of bloom at both the VESA test scanning frequencies. It also had an alarmingly high measured Swim Ratio in 800-by-600 mode.

COVER STORY

17-INCH MONITORS

Mitsubishi Diamond Pro 17, the Nanao Flexscan F550i, the NEC MultiSync 5FG, the Relisys RE1776 17-Inch High Resolution Multiscan Color Monitor, the Seiko CM1760LR, the Sony CPD-1604S 17" Multiscan Trinitron Color Monitor, the Tatung CM-17MBD, the Toshiba P17CM01, and the ViewSonic 7. We made an exception for the HP Ultra VGA 17-Inch Display, which was shipping only in Japan at the time testing began. HP says the unit should be available in the United States by the time this issue is published.

Though the products represented in this review will give you a more than adequate sampling of the marketplace, you can also look for 17-inch monitors to arrive by early summer from ADI Systems, AOC International (USA), Arche Technologies, Copam USA, Darius Technology, Electrohome, General Business Machines Corp., Hitachi/Nissei Sanyo America, Lite-On Technology Corp., Qume Peripherals, Supercom Industries, Swan Technologies, Taxan America, TVM Professional Monitor Corp., and Wyse Technology. Compaq Computer Corp. was just entering the 17-inch market with its \$1,299 QVision 170 Color Monitor at review time and was unable to get a unit to us in time for testing. Sampo should be shipping its AlphaScan by the time you read this.

Samsung had a 17-inch monitor available at test time, but the unit did not support a 70-Hz refresh rate at 1,024-by-768 resolution. The company was planning to discontinue that model in favor of one that does support the VESA-recommended 1,024-by-768 refresh rate by the time you read this. We received the Fora Adonix C172 in time for testing, but were unable to make it work at 70 Hz in 1,024-by-768 mode, although the company claims the monitor supports that feature. We sent the monitor back to the company for repairs, but it was unable to fix the problem in time for this review. Everex Systems has plans to market a product based on the NEC MultiSync 5FG by the time you read this, while KRIS Technologies and Matrix Digital Products currently produce their own versions of the MAG MX17F reviewed here.

Finally, we missed the ThinkSync 7M, from IOcomm International Technology (310-644-6100), during our product acquisition phase. The \$1,495 ThinkSync 7M is a 17-inch flat-square monitor with a 0.28-mm dot pitch, capable of resolutions up to 1,280-by-1,024. It is VESA-

compatible at both 800-by-600 and 1,024-by-768 modes. The ThinkSync 7M also contains a microprocessor capable of storing 8 preset and 8 user-defined settings.

Remember, a hardware investment in Windows is incomplete without considering video. A bigger and better display is as important an element for improving your productivity as is a faster processor or graphics accelerator card. And don't forget, along with your keyboard and your mouse, your monitor directly affects your physical well-being. Read the reviews that follow, compare the subjective findings with PC Labs' Superspot numbers, scan the features table, and then put a monitor on your desk that will help you run Windows better and save you from eyestrain at the same time.

ACER AMERICA CORP.

AcerView 76

by Ed Perratore

For everyday Microsoft Windows work at a low \$1,099 price, Acer America Corp.'s AcerView 76 offers plenty of display room and good image quality. But with a mediocre 0.31-mm dot pitch, the monitor is not designed for extreme detail work.

The AcerView 76's price includes a tilt/swivel base, removable power cord, and built-in adapter cable with a miniDB-15 connector for the video card. The 42-



The \$1,099 AcerView 76 provides a low price, but it has a coarse 0.31-mm dot pitch. Despite this, image quality is good for general applications, though you will not want to use this system for detail work.

pound monitor comes standard with the ability to accept several video signals from 1,024-by-768 (noninterlaced and interlaced) on down. The AcerView 76 employs a microprocessor and offers an image size default storage capacity of 14 modes and the opportunity for users to store 16 more. By the time you read this, Acer expects to provide VLF and ELF radiation control, as well.

What discerning users will notice, however, is the unit's 0.31-mm dot pitch: coarse for monitors in this roundup and part of the reason for the low price. Acer plans to release similar models with 0.28-mm and 0.26-mm dot pitches in the near future. You should also note that the AcerView 76 is a fixed-frequency multiscan monitor, rather than a more flexible variable-frequency multiscan model.

SCREEN AND IMAGE QUALITY

Acer's tube, manufactured by Toshiba, has a conventional shadow mask attached to a flat-square screen. The 17-inch tube has an actual diagonal image display measurement of 15.6 inches. Picture quality was good for everyday applications such as word processing or spreadsheets programs in both 1,024-by-768 and 800-by-600 modes. The monitor did particularly well on our tests for Line Width Variance and Vertical-Line Convergence. Among the AcerView 76's controls is one that will adjust pincushioning. The monitor's scores on the Horizontal and Vertical Pincushioning tests proved to be within the acceptable range of less than twice the respective line width, which corroborated our subjective application tests.

The monitor's controls, all readily accessible beneath the screen, include several LEDs (light-emitting diodes) that indicate which image-size adjustment mode you have chosen, using the Select button. Once in the desired mode, two adjustment buttons let you smoothly shift the display, say, to the left or right for horizontal positioning. (You can also recall your video board's factory default settings.) Besides this and pincushioning, other controls include horizontal and vertical size, along with vertical positioning. Brightness and contrast are adjusted through dials.

Acer's technical support is available only to dealers and distributors weekdays from 7:00 A.M. to 7:00 P.M. P.S.T., who contact Acer if the user needs to ship the monitor for repair during the 12-month warranty. If shipping is required (to

COVER STORY

17-INCH MONITORS



FACT FILE

AcerView 76

Acer America Corp., 2641 Orchard Pkwy., San Jose, CA 95134; 800-733-2237.

List Price: \$1,099.

Requires: VGA or better graphics adapter.

Visible Diagonal Screen Size: 15.6 inches.

In Short: The AcerView 76's 0.31-mm dot pitch makes it prohibitive for detail work. But the monitor is primarily targeted toward general-purpose Microsoft Windows users, and it offers plenty of attractive features for its price: good image quality, easy-to-use display controls, and several stored mode image size settings.

CIRCLE 509 ON READER SERVICE CARD

Monitor Maintenance Corp. on the East Coast and to Acer otherwise), Acer will mirror the shipping terms when returning the repaired unit.

If your budget is tight and you do not need a very fine dot pitch, there's a lot to like in the AcerView 76. But wait for the lower dot pitches of newer Acer models if you do a lot of detail work.

AMERICAN MITAC CORP.

American Mitac M1758

by Oliver Rist

The American Mitac M1758 costs only \$999, making it the cheapest monitor in this roundup. Unfortunately, in this instance, it's all too true that you get what you pay for.

Even just out of the box, the 44-pound Mitac M1758 looked forlorn. With no tilt/swivel base (a \$35 option that the company did not provide for testing), the unit sat stiffly while most of the competition



With a 0.31-mm dot pitch and problems with image quality, the \$999 American Mitac M1758 leaves much to be desired.

limbered up to the comfort requirements of their users. It also offers one of the smaller diagonal image display measurements we saw—15.3 inches. The unit has two connectors, a 9-pin and standard DB-15-pin. It came with a short (46-inch) 9- to miniDB-15-pin adapter cable (you might have trouble hooking this one up if your PC is standing under your desk), and a removable 70-inch power cable. The only other interface options available are a BNC conversion cable and a Mac II adapter.

The variable-frequency multiscan monitor can accept video signals from 1,024-by-768 (interlaced and noninterlaced) on down to VGA. It supports vertical scanning frequencies from 50 Hz to 90 Hz, and horizontal scanning frequencies from 31 kHz to 58 kHz. The flat-square screen monitor uses a shadow mask made of Invar. The system offers only a 0.31-mm dot pitch.

The manual is only 30 pages long, but much of it repeats the English instructions in four other languages. But don't let the lack of in-depth instruction bother you; with the Mitac M1758's dearth of features, not much help is needed. Plug in the power cord and then the adapter cable, turn the monitor on, and start fiddling with the analog picture controls.

Besides power, brightness, and contrast, there are only the four usual image-sizing controls (horizontal and vertical position and horizontal and vertical size) and a mode on/off switch that for some reason disables all of the picture controls except for vertical positioning. You will probably want to steer clear of that one: With the Mitac M1758's mediocre performance, you will need all the picture control you can get. Unlike many of the other monitors in this roundup, the Mitac M1758 does not have a microprocessor, nor is it capable of storing any image-size settings.

PERFORMANCE ISSUES

The performance of the Mitac M1758 left almost as much to be desired as did its sparse features set. Though its Line Width Variance scores showed nearly perfectly square pixels in 800-by-600 mode, it scored a very poor 0.42 on the Swim Ratio test and an equally poor 15 mils on the Vertical-Line Convergence test at that resolution. In 1,024-by-768 mode, its Line Width Variance scores were again excel-



FACT FILE

American Mitac M1758

American Mitac Corp., 410 E. Plumeria Dr., San Jose, CA 95134; 800-648-2287, 408-432-1160.

List Price: \$999.

Requires: VGA or better graphics adapter.

Visible Diagonal Screen Size: 15.3 inches.

In Short: Though the American Mitac M1758 certainly had the lowest list price in this roundup, it also had one of the barest features sets. Coupled with a below-average image, this should make you look elsewhere.

CIRCLE 510 ON READER SERVICE CARD

lent. Its Vertical-Line Convergence improved at the higher resolution, although at 8.79, test results were still over the point at which convergence can be seen with the naked eye.

We also observed an ugly and impossible-to-remove blue band running down the left length of the screen in all video modes, about 2 inches into the working Microsoft Windows area. The company was unable to provide a solution to this problem. The band lessened slightly in 800-by-600 mode from 1,024-by-768, but it was still clearly visible, and still very annoying.

American Mitac provides a one-year warranty on parts and labor and offers toll-free technical support weekdays from 8:00 to 6:00 P.S.T. If price is of the utmost importance, this system is certainly the most inexpensive we saw, even including the tilt/swivel option. But check out the competition first: Even if you have to spend a little more, you will probably walk away with a more satisfying purchase.

CTX INTERNATIONAL INC.

CTX-1760

by Oliver Rist

At \$1,399, CTX International's CTX-1760 won't overwhelm you, but neither will it disappoint you if you are looking for a vanilla low-cost monitor with a pleasing look and an acceptable features set. The system's main drawbacks are erratic performance scores, pincushioning problems, and, if you do detail work, a rather coarse 0.31-mm dot pitch.

The 52-pound CTX-1760 comes nicely packaged, complete with a tilt/swivel base, a power cable, and a 56-inch miniDB-15-to-miniDB-15 adapter cable. The

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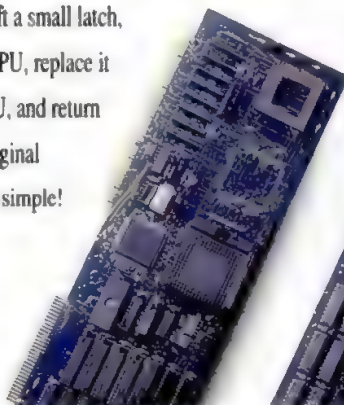
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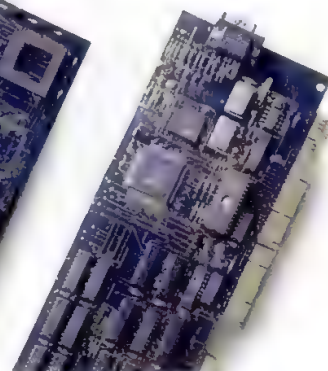
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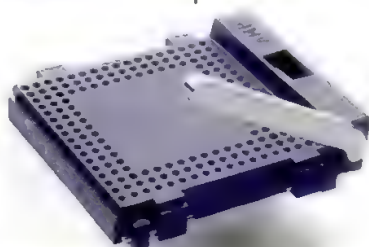
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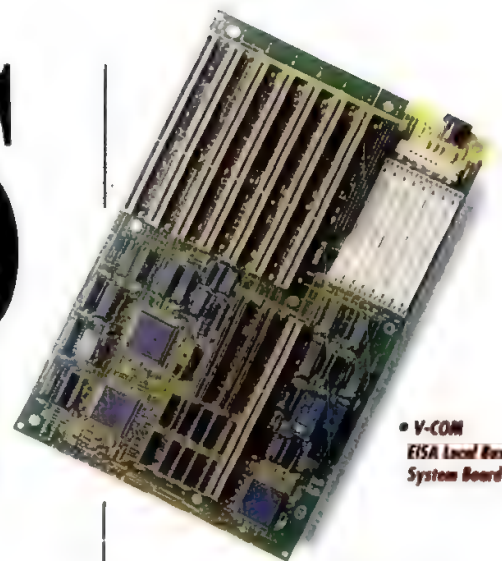
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shadow mask tube used in this display is made of Invar, and the unit offers a full 16-inch-diagonal image display area. The manual is pleasantly plump and informative, which is always good, though you probably won't need it to get up and running. Just plug in the two cables and switch the monitor on.

The variable-frequency multiscan unit comes equipped with a microprocessor and is able to store up to 15 image size and position settings in memory. Out of the factory, the monitor comes with three preprogrammed settings for the most popular VGA, Super VGA, and 1,024-by-768 frequencies.

The monitor is fully VESA-compliant, handling all the maximum recommended refresh rates without complaint. The monitor also supports 1,280-by-1,024 at 60 Hz.

The CTX-1760 has all digital image-position controls and an LED readout to tell you what setting you are in. The controls are all mounted within easy reach under the monitor's front bezel.

STRENGTHS AND WEAKNESSES

On PC Magazine Labs' tests, the CTX-1760 performed within acceptable parameters, exhibiting definite strengths and weaknesses. It tied with the American Mitac M1758 for exhibiting the best Line Width Variance in 800-by-600 mode, but suffered a noticeable decrease in that area in 1,024-by-768. The CTX-1760's Vertical-Line Convergence scores were dead last in both resolutions. Its Swim Ratio score in 1,024-by-768 mode was good for this class.

On our subjective bandwidth tests, the flat-square screen showed bright, even



Poor convergence and noticeable horizontal pincushioning are problems for the \$1,399 CTX-1760, but bright, even lines are pluses for this unit.

COVER STORY 17-INCH MONITORS



FACT FILE

CTX-1760

CTX International Inc., 20530 Earlgate St., Walnut, CA 91789; 714-595-6146.

List Price: \$1,399.

Requires: VGA or better graphics adapter. Visible Diagonal Screen Size: 16.0 inches.

In Short: The CTX-1760 is at best a vanilla 17-inch tube with an acceptable but not overwhelming features set. The unit suffers from erratic performance and incorrigible pincushioning, but its low cost may make it an option for buyers on a budget.

CIRCLE 511 ON READER SERVICE CARD

lines that were clear and not muddy, though 1,024 by 768 was certainly the better resolution in this regard. The unit did exhibit a slight color smudging on the left side that looked like dirt on the screen but was evidently a tangible measure of the tube's poor convergence. Despite the 0.31-mm dot pitch, the image did not appear grainy for working in applications such as word processors, though users who need a system for detail work may be harder to please.

Unlike many of the other monitors here, the CTX-1760 was not equipped with a pincushioning control; too bad, this screen could use one. Although its Pincushioning scores on our tests were within PC Magazine Labs' acceptable range (no greater than twice the respective line widths), from a subjective standpoint, horizontal pincushioning was a noticeable problem. Both left and right sides of the viewing area were marred by this defect, though the right side was surely worse. Manipulating the image position helped slightly and the problem was much less severe in 800-by-600 than 1,024-by-768.

CTX claims it has solved the pincushioning problem on new versions of this monitor. The company also says it will be offering a low-emissions model by fall.

The CTX-1760 comes with a generous 2-year warranty, and the company supplies toll-free technical support weekdays from 9:00 to 5:00 P.S.T. Extended service contracts are available on an individual basis.

To purchase a CTX-1760, you must call CTX's sales number, so lower street prices are unlikely. The CTX-1760 is an average and not unacceptable specimen for a 17-inch monitor, especially for buyers

on a budget, but it probably won't be at the top of most users' lists. There are better bargains out there.

EPSON AMERICA INC.

Epson Professional Series

by Ed Perratore

PC and printer maker Epson America can take some pride in its 1,024-by-768 Epson Professional Series 17-inch monitor. Intended for detailed graphics work, the Epson Professional Series comes with a 0.26-mm dot pitch and a generous set of display controls.

The \$1,539 monitor, available only from dealers, comes with a helpful manual, tilt/swivel stand, detachable adapter cable, and removable power cord. The monitor end of the adapter cable is BNC-5 (for wider bandwidth and better shielding); at the other end is a miniDB-15 connector for your VGA card. If your video adapter uses only BNC ports, you will need to purchase a BNC-to-BNC cable elsewhere; Epson does not sell one.

Using a flat-square screen with an Invar shadow mask, the 50-pound Epson monitor produced bright, crisp colors with a minimum of glare, owing to its silica coating. The viewing area itself measures a healthy 16.3 inches on the diagonal. No low-emissions certification has yet been attained.

SEVEN FACTORY-SET MODES

The Epson is a variable-frequency multiscan monitor. It includes seven factory-



The \$1,539 Epson Professional Series has a 0.26-mm dot pitch, which helps maintain its sharp image. A silica-coated screen reduces glare.



Imagine
This Kind of Power
at Your Fingertips.



**HOT NEW ZEOS®
'386 AND '486 SYSTEMS!**

PC Magazine calls it "the ultimate-power desktop PC." What will you call your new ZEOS '486 Editors' Choice system? Probably the hottest computer you've ever owned! And that's just for starters.

Because never before has so much value been available for so little money. We call it *ZEOS Value*. Starting with the incomparable ZEOS 386-33 right up thru our two new 486-50s. ZEOS gives you more for your money than anyone else.

First of all, our prices are great! You can get a ZEOS 386-33 upgradable for as little as \$1,395. Or you can move right into a *complete 486DX-50MHz for only \$1,995*. Outrageous! And it's not just the price. It's all the extras we give you, too.

As an example, your new ZEOS Windows system comes complete with your choice of two out of three great Windows applications: *Lotus 1-2-3 for Windows*, *Ami Pro 2.0*, and *Freelance Graphics*. These are not trial copies or sample disks, they are full-blown, fully documented production packages. And, with a suggested retail of close to \$1,000, even at "street prices" that's a *great* value. It's ZEOS value. After all, ZEOS sets the pace for innovation and value for you in the direct marketing channel. Here's another good example.

You have probably heard about the importance of protecting your new



ZEOS. *Nine times Editors' Choice. Your Best Choice as Well!*



computer investment with a surge suppressor. Well, your new ZEOS upgradable desktop system already has one. *Built into the power supply!* That's innovation, built in from ZEOS.

Here's another innovation we introduced to the hardware industry. *24-Hour-a-Day Toll-Free Technical Support*. While most of the others still only offer part-time technical support, as a ZEOS customer,

you get around-the-clock 24-hour-a-day support, 365 days a year. Not that you'll need the help. But it's comfort-

ing to know if you do have a question, all you have to do is

pick up the phone and give us a call, *any time* of the day or night!

And all of

this is just for starters. Because when you turn the page we're going to talk about a lot of other very exciting and important reasons for you to buy from ZEOS. Like 486SX-25s, the new 486DX-50s, your ZEOS Editors' Choice '486 and more. A whole lot more.

Come on in!



Packages #3 and #4 incorporate these suggestions.

Certainly another option you may want to consider is our Vertical case. This heavy-duty case holds more drives than most others and has a

top-notch power supply and plenty of cooling.

**YOUR ZEOS EXTRAS.
NO EXTRA CHARGE.**

And don't forget, if you purchase a ZEOS Windows system we'll also include your choice of two: *Lotus 1-2-3*

Expansion slots
High-Capacity Power Supply
2 serial, 1 parallel,
1 game port



Built-in Surge Suppression
Two cooling fans
24-Hour-a-Day Tech Support
System UL® Listed
FCC Class B
30-Day Money-Back Guarantee
1 Full Year Limited Warranty
Microsoft DOS
Microsoft Windows
Microsoft Mouse
Lotus 123 for Windows*
Freelance Graphics*
Ami Pro 2.0 for Windows*
Adobe Type Manager
WinRix Drawing Package
24-Hour Sales
800-423-5891

Consider the Vertical Option. We can build your new upgradable system in our eight-bay vertical case. It comes complete with our high-capacity power supply and two cooling fans. Add only \$150.

for Windows, Ami Pro 2.0, and Freelance Graphics. You'll be getting all the other ZEOS extras too.

If you don't go with the Vertical case, we'll send your 486DX2-50 in our seven-bay SpaceSaver case; it's complete with our top quality *high-capacity* power supply, *built-in surge suppressor*, and *two* whisper-quiet cooling fans.

Remember too, ZEOS also provides you with 24-Hour Support, our 30-Day Money-Back Guarantee, One Full Year Limited Warranty and our Express Parts Replacement Policy.

Ordering your new ZEOS is easy. Simply give us a call. You're going to love your new ZEOS '50. And that's

a guarantee! Call now Toll Free 800-423-5891.

486-50MHz.

50MHz Price Barrier!

ZEOS COMPLETE SYSTEM PACKAGE #1

- The processor and speed of your choice plus future upgradability!
- 1MB of high-speed RAM, expandable to a system total of 32MB right on the motherboard.
- 42MB high-speed IDE hard drive with its own cache.
- 1.2MB or 1.44MB Teac® floppy drive.
- ZEOS 14" flat screen Hi-Res amber monitor with Tilt/Swivel Base.
- Shadow RAM and EMS support for enhanced performance.
- ZEOS/RS 101-key SpaceSaver keyboard.
- Two serial, one parallel & one game port built right onto the motherboard.
- 7-16, 1-8 bit expansion slots. 80387 math co-processor support for '386 systems.
- Rugged ZEOS SpaceSaver case with twin cooling fans for added reliability and product life.
- Seven drive bays and our high-capacity power supply with built-in surge suppressor!
- Includes ZEOS 24-Hour-a-Day Toll-Free Technical Support and Customer Satisfaction package.

INCREDIBLE ZEOS PACKAGE #2

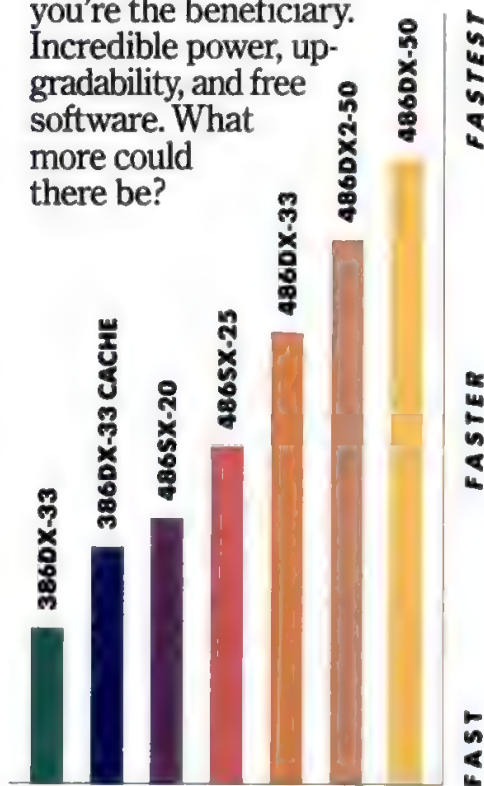
We take Package #1 and upgrade your ZEOS Modular System to include:

- 2 full Megabytes of rip-roaring RAM.
- Our incredible 107MB IDE hard drive with its own built-in cache.
- Both the Teac® 1.2MB and 1.44MB floppy drives.
- Diamond Stealth VGA card/1MB RAM & Sierra DAC plus WinRIX drawing software!
- ZEOS 14" High-Res VGA mono monitor with Tilt & Swivel Base.
- Microsoft Mouse, Microsoft Windows and DOS, plus 2 out of 3 Windows applications: Lotus 1-2-3 for Windows, Ami Pro 2.0, and Freelance Graphics!

Now, ZEOS lets you pick exactly the power you want for the price you want to pay. Simply match the processor with the package configuration and you have your price. Or if you wish, we will custom build any system to your exact specifications.

And don't forget, with every ZEOS Windows System (packages 2, 3 and 4) you'll also receive your choice of 2 out of 3: *Lotus 1-2-3 for Windows*, *Ami Pro 2.0*, and *Freelance Graphics*. The Lotus software alone carries a suggested retail of over \$1,000 and even street prices are over \$700. Yet we're giving it to you at *no additional charge!* That's ZEOS value.

No doubt about it. ZEOS has broken the price/performance barrier with these great new upgradables, and you're the beneficiary. Incredible power, upgradability, and free software. What more could there be?



Z-SPEED GRAPHOMETER

Let the "Z-Graphometer" help you pick the processing power that's right for you. The comparisons are easy to make. Fast, Faster and Fastest!

Or
Customize, Customize,
Customize!
Just Tell Us and
We'll Do It.

Pick Your Power!

ore Power.

ZEOS ANNOUNCES: BUILT-IN SURGE SUPPRESSION!

Right now, ZEOS is proud to announce that we've taken our top-of-the-line high-capacity supply and added a *built-in surge suppressor*. Building the surge suppressor right into the power supply increases reliability and helps protect your investment. We wonder how long it will take for the rest of the industry to catch up. And while ZEOS is giving you critically important features like these, we add yet another.

UL Listing!* As *PC Magazine* said, UL Listing is "one of the few forms of peace of mind you can buy." Every ZEOS system is Underwriters Laboratories Listed. This means your entire system (not just the power supply) has met the stringent safety requirements

of Underwriters Laboratories. Not only that, but your ZEOS UL listing says a lot

Prices. ded!

Now
pick two
Windows
applications
from
Lotus!



about quality too. UL safety listings are something many of our competitors simply don't (or can't) provide you. At ZEOS, quality and safety are important to us. *You are important to us!*

24-HOUR-A-DAY TOLL-FREE TECHNICAL SUPPORT.

The importance of having you as a customer shows in many other ways as well. For example, at ZEOS we believe supporting *you* should be more than a part-time proposition. As *PC Magazine* said, "Insist on a good service and support package. Expect...24-hour seven-day-a-week support." We've been saying that for years. In fact, it was ZEOS that invented *24-Hour-a-Day Toll-Free Sales and Technical Support*. Our customers tell us they love it. And you will too. Any time you need assistance, a ZEOS technician is only a phone call away.

Price, Performance. Quality and Support. There are *many* reasons to buy your new ZEOS system. All of them backed by your ZEOS Customer Satisfaction Package which includes our 30-Day Money-Back Guarantee, One Full Year Limited Warranty and Express Parts Replacement Policy. How do you get one?

ORDERING IS EASY!

Ordering your new ZEOS system is indeed easy. Simply pick the Power and Package you want or let us custom build your new system to your exact specifications! Whatever you decide, a friendly and knowledgeable ZEOS Systems Consultant is waiting to assist you. And whatever you select, one thing is for certain.

Buying your new ZEOS system is perhaps the best purchase decision you'll ever make. So why not give us a call right now. You're going to be very satisfied. We don't just say it. We guarantee it! *Call Now Toll Free, 800-423-5891.*

**ANNOUNCING THREE HOT
NEW PROCESSOR OPTIONS:
486SX-25, 486DX2-50 AND
486DX-50!**

Go ahead and Pick your Power! ZEOS gives you all the options. You can start out by taking a look at the de facto desktop power standard, the 386DX-33. Our '386-33 workhorse is a great entry point for true desktop power computing. But if it's a '486 you're after, hang on to your hat!

Because you're off to a fast start with a 486SX-20 or our brand new 486SX-25. The 486SX is like a 486DX without the built-in math coprocessor. It's the easiest way to own the '486. And for full-blown 486DX power, why not opt for your own *Editors' Choice* system!

It's the ZEOS Editors' Choice 486DX-33. Quite simply, there is nothing else like it. Go with the ZEOS '486 if you want the type of quality, performance and value that makes an *Editors' Choice* machine. And if it's 50MHz you've been dreaming about, dream no more.

Because right here, right now, ZEOS gives you the option of '486 50MHz power! We're talking power unlike anything you've seen before. Take either the ZEOS 486DX2-50 or the 486DX-50. Absolutely unbelievable *performance!* And the price? That's what you really won't believe; only a couple hundred dollars more than the ZEOS 486-33. *Amazing.*

AND THAT'S JUST FOR STARTERS.

Because ZEOS combines the high-speed upgradable processor of your choice with some of the fastest DRAM made. Both are mounted on your ZEOS system board, one of the most advanced in the industry. And that's where your new system really begins to shine.

Because to this we add an *incredibly*

ZEOS. Mc

fast IDE hard drive and genuine Teac® floppy drives. We have located the ports for these drives right on the motherboard along with your serial, parallel and game ports. The result? Two slots are saved, giving your new ZEOS system a total of *seven*. All this while others are trying to get you to accept fewer slots. It's part of your ZEOS expansion advantage. The slots to expand, how about the room?

This is where ZEOS has performed something akin to magic. We call it our SpaceSaver case. Complete with *seven* drive bays, this incredible case is actually smaller than many cases offering only five drive bays. Plus, we've also added a *second whisper-quiet cooling fan*. Why? Because the cooler a system runs the longer it will last.

Now that's ZEOS Value. Speaking of which, here's another industry first you will definitely benefit from.

Great Load



From ZEOS, lots more.

Because your new ZEOS system is not only fast, it's absolutely loaded with features. Like our 300 watt power supply with *built-in surge suppression*, eight expansion slots, twin cooling fans for even more reliability, plus our unique seven-bay Space-Saver case. And, every ZEOS system is UL® listed.

And don't forget you're also receiving 24-Hour-a-Day Toll-Free Technical Support, our 30-day Absolute Satisfaction Money-Back Guarantee, Express Parts Replacement and more. So go ahead.

Pick your Power, your Package, and your Price and give us a call! *Call Now Toll Free 800-423-5891.*

PACKAGES 2, 3 AND 4 INCLUDE LOTUS BUNDLE!

	Pkg. #1	Pkg. #2	Pkg. #3	Pkg. #4
386DX-33	\$1395	\$1895	\$2395	\$2795
486SX-20	\$1495	\$1995	\$2495	\$2895
486SX-25	\$1595	\$2095	\$2595	\$2995
486DX-33	\$1695	\$2195	\$2695	\$3095
486DX2-50	\$1895	\$2395	\$2895	\$3295
486DX-50	\$1995	\$2495	\$2995	\$3395

Add \$200 to any price for a 128K cache.

PICK YOUR PAYMENT OPTION TOO:

When you buy from ZEOS you have a wide variety of payment options. We accept MasterCard, VISA, American Express and Discover cards, or if you wish we can ship COD.

We also have our own ZEOS credit card, the Z-Card®. The Z-Card allows you to charge your ZEOS purchases just like a MasterCard or VISA. There is a low consumer rate and there is no annual fee. We can send you an application or you can apply right over the phone. Our special toll-free application number is 800-421-8942.

ZEOS also offers a terrific leasing program for businesses. The rates are lower than those charged by most of the others in our industry. We will promptly mail or fax you an application on request. Just give us a call at 800-423-5891.

Purchase orders from Fortune 1000 companies, governments and institutions are subject to credit approval. Wire transfer is also available. Please call 800-423-5891 for details.

INCREDIBLE ZEOS PACKAGE #3

Add even more memory, a larger drive. And more savings! You now receive:

- 4 full Megabytes of ultra-high-speed RAM.
- Our fast 130MB IDE hard drive with built-in cache.
- Teac® 1.2 & 1.44MB FDD'S!
- Diamond Stealth Hi-Color VGA card/1MB RAM (32,000+ colors) plus WinRIX drawing software!
- ZEOS 14" 1024x768 non-interlaced VGA Color monitor w/Tilt & Swivel.
- Microsoft Mouse, Microsoft Windows and DOS, plus 2 out of 3 Windows applications: Lotus 1-2-3 for Windows, Ami Pro 2.0, and Freelance Graphics!

THE ULTIMATE ZEOS PACKAGE #4

Now, memory goes to 8MB and the drive to 210MB. PC Magazine Editors' Choice configuration!

- 8 full Megabytes of high-speed RAM.
- Your screaming 210MB IDE hard drive with its own built-in cache.
- Teac® 1.2 & 1.44MB FDD'S!
- Diamond Stealth Hi-Color VGA card/1MB RAM (32,000+ colors) plus WinRIX drawing software!
- ZEOS 14" 1024x768 non-interlaced VGA Color monitor w/Tilt & Swivel.
- Microsoft Mouse, Microsoft Windows and DOS, plus 2 out of 3 Windows applications: Lotus 1-2-3 for Windows, Ami Pro 2.0, and Freelance Graphics!

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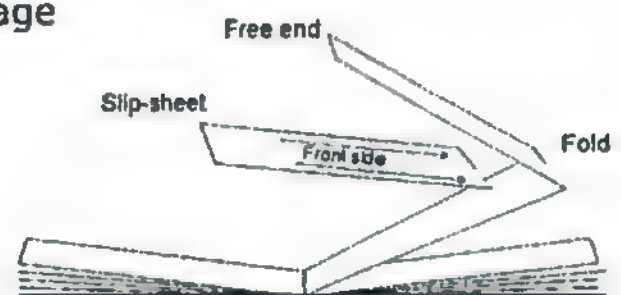
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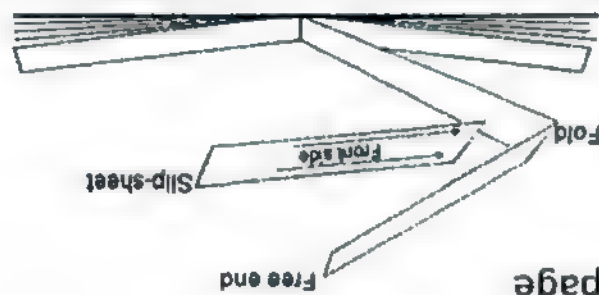
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2. Insert this sheet with
 1. Front side touching the free page
 2. Arrow pointing to the fold
3. Slice the folded edge
4. Close the page and slip-sheet



Foldout slip-sheet

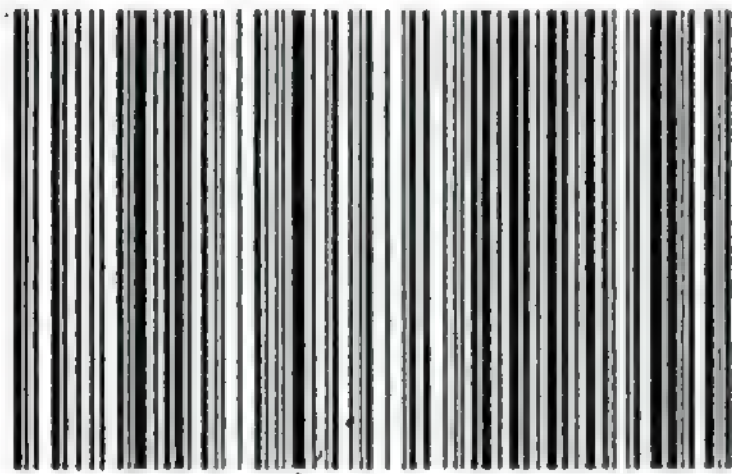


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2. Insert this sheet with
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3. Slice the folded edge
4. Close the page and slip-sheet



1. Follow instructions on the other side

Inverted Back



GbsSlpBack-001B

Back

1. Follow instructions on the other side

If you thought power like this was out of your budget, take another look. While many of the others don't even offer 50MHz power, *you can own the new ZEOS 486DX2-50 starting complete for as low as \$1895, or the full-blown 486DX-50 for as low as \$1995!*

Select from any of four money-

debuting later this year. We would strongly recommend at least 4 megabytes, eight if it's in the budget. As for drives, think in terms of 100+ megabytes; applications just don't seem to be shrinking (however, before you go too wild, remember you can always add more drives). Both of our

ZEOS POWER GRID FOR THE 486DX2-50

Apply The "Zeos Power Grid" To Match Your 50MHz Needs. Add \$200 for 128K cache. Prices shown are for Intel 486DX2-50 CPU; for 486DX-50 add \$100.

Pkg. #1 Only \$1895

Pkg. #2 Only \$2395

Pkg. #3 Only \$2895

Pkg. #4 Only \$3295

Intel 80486DX2-50MHz	Upgradable CPU	1MB High-Speed RAM	2MB High-Speed RAM	4MB High-Speed RAM	8MB High-Speed RAM	42MB HDD, Fast IDE	130MB HDD, Fast IDE	210MB HDD, Fast IDE	Teac® L2 Floppy Drive	Teac® L44 Floppy Drive	14" Hi-Res TTL Monitor	14" VGA Mono Monitor	14" VGA Color 1024 x 768 NI	Monitor Tilt & Swivel	Hercules® Graphics Card	Hi-Color VGA Card, 1MB	Sierra DAC	Shadow RAM/EMS Support	ZEOS/RS 101 keyboard	7-16, 18 bit
■	■	■				■			■	■	■		■	■				■	■	■
■	■		■			■			■	■	■		■		■	■	■	■	■	■
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■	■				■			■	■	■		■	■		■	■	■	■	■	■

saving packages. Or, if you wish, let us custom-build your hot new 486-50 to your exact specifications.

WHAT SHOULD I GET?

How should you configure your new ZEOS 486-50? Of course the best answer depends on your needs and what you plan to use your new system for. But never before has so much power been available to everyone at such a low price. Our suggestion would be to consider investing in two areas when you buy your new 50MHz system. The memory and drives. Particularly the memory.

From what we're hearing, memory will be important with the new operating systems

Your Own '4

ZEOS Breaks the '486-



Computers Now! SM

Take Your Pick. We'll Ship Today!



RIGHT NOW. GUARANTEED!*

Yes, we can ship your new ZEOS '386 or '486 today! We've

built up an extra supply of the hottest selling computers in America in their most popular configurations.

Here's how it works. We have these incredible ZEOS '386 and '486 color VGA systems pre-built and ready to ship. While supplies last, we will ship any of these systems to you *the day you order* subject to these conditions:

1. Your order must be received by 1PM Central Time M-F.
2. Credit Cards are subject to authorization.
3. Orders must be for ZEOS '386 or '486 systems configured as shown here. Any other systems or upgrades are custom-built and will take slightly longer.

*OUR GUARANTEE TO YOU:

If we accept your order for immediate shipment and fail to ship your

system under the conditions outlined, we will ship it at *our expense* as soon as it is ready.

This offer is good only as long as these pre-built systems remain in stock; please give us a call to verify availability. This offer does not apply to other ZEOS systems or custom configurations.

IMMEDIATE SHIPMENT IS ONLY PART OF THE STORY.

These are not just any computer systems. They're the high performance, high quality ZEOS *upgradable* systems. Packing all the ZEOS value that has won PC Magazine Editors' Choice—*nine times!*

So why not give us a call right now. If we hear from you by 1:00 this afternoon, we'll get your new system on the way to you today! Call now Toll Free 800-423-5891.



Our most popular '386 & '486 packages! 128K Cache, 130MB Drive, 4MB Memory and More. Ready to ship today!
386-33 ONLY \$2595.
As a 486-33 ONLY \$2895!

- Upgradable CPU module allows you to change processors as your computing needs change!
- Ultra-high-speed zero-wait 128K SRAM cache.
- 4MB of zero-wait DRAM, expandable to a total of 32MB on the motherboard.
- Ultra-fast 130MB IDE hard drive.
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- Incredible Diamond Stealth Hi-Color VGA graphics card with 1MB RAM and Sierra DAC (32,000+ colors) plus WinRIX drawing software!
- Microsoft Mouse, Microsoft Windows and DOS, plus 2 out of 3 Windows applications: Lotus 1-2-3, Ami Pro 2.0, and Freelance Graphics!
- Shadow RAM and EMS support for enhanced performance.
- ZEOS/RS 101-key SpaceSaver keyboard.
- High-speed ZEOS I/O with two serial, one parallel & one game port built in.
- 7-16, 1-8 bit expansion slots. Math coprocessor support for '386.
- Rugged ZEOS SpaceSaver case with two cooling fans for added reliability and product life.
- Seven drive bays and our high-capacity power supply now with its own built-in surge suppressor.
- Includes ZEOS 24-Hour-a-Day Toll-Free Technical Support and Customer Satisfaction package.

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Low Consumer Rate
& No Annual Fee!

Here's another great reason to buy a ZEOS system: the Z-Card®! The Z-Card works just like a MasterCard or VISA—so you can charge your ZEOS purchases and pay in easy monthly installments. And with no annual fee and a low interest rate, it makes buying your new ZEOS system easier than ever!

Z-Card



PC Buyer

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You can apply for your very own Z-Card and low, low monthly payments right now. Simply fill out the application below and fax it to 612-633-7507. Or mail it to ZEOS International, Z-Card Processing Center, 530 5th Ave. NW, St. Paul, MN 55112.

We'll contact you as soon as your credit line is established, usually within 24 hours of receipt. Apply today!

Apply for your own Z-Card today!

A. YOUR PERSONAL INFORMATION

Please complete all appropriate sections, providing at least two years residence and employment history. **THIS IS NOT A CREDIT AGREEMENT!** One will be sent to you upon authorization of an account. (This form must be signed to process your order.) All financed purchases are subject to credit approval. If you have any credit questions, please call 800-421-8942 for assistance. Thank you!

Name _____
Home Phone (_____) _____
Soc. Sec. No. _____ Date of Birth ____/____/____
Address _____ Apt. _____
City _____ State _____ Zip _____
Since? (Mo./Yr.) _____ ☐ Buy ☐ Rent ☐ Other _____

A married person may apply for individual credit. I am applying for (please check appropriate box):
☐ **JOINT CREDIT** with another person. Complete entire application.
☐ **INDIVIDUAL CREDIT** but rely on income or assets of another person as a basis for repaying the credit requested. Complete entire application.
☐ **INDIVIDUAL CREDIT.** Do not complete Section C.**
**If you are a married Wisconsin applicant, you must provide your spouse's information as indicated, even though your spouse may not be signing the contract.

NOTICE TO WISCONSIN APPLICANTS:
YOU MUST DISCLOSE YOUR MARITAL STATUS:
☐ married ☐ unmarried ☐ legally separated

B. CREDIT INFORMATION

PLEASE TELL US IF YOU HAVE A:

Checking Account	☐ Yes ☐ No		
Savings Account	☐ Yes ☐ No		
	Y/N	How Many?	Y/N How Many?
Bank Loan	_____	_____	Dept. Store Charge Card _____
VISA	_____	_____	Credit Union Account _____
MasterCard	_____	_____	Other Major Charge Cards _____
Finance Company Loan	_____	_____	

CUSTOMER AUTHORIZATION

I authorize ZEOS International, Ltd. or its assignees to investigate credit records and to report my performance hereunder to credit agencies. I hereby certify that the following information is furnished to you for the purpose of obtaining credit and is true and correct to the best of my knowledge and belief.

Applicant's Signature _____
Date _____

There are costs associated with the use of this credit card. To obtain more information about these costs, call us at 800-421-8942 or 612-635-0613 or write to ZEOS, Z-Card Processing Center, 530 5th Avenue N.W., St. Paul, MN 55112.

NY — A consumer credit report may be requested in connection with this application or in connection with updates, renewals or extensions of any credit granted as a result of this application. If I subsequently ask for this information, I will be informed whether or not such a report was requested and, if so, the name and address of the agency that furnished the report.

OH — The Ohio laws against discrimination require that all creditors make credit equally available to all creditworthy customers and that credit reporting agencies maintain separate credit histories on each individual upon request. The Ohio Civil Rights Commission administers compliance with this law.

*Financing not available in Alaska, Hawaii or outside the continental U.S.

C. JOINT APPLICANT INFORMATION

Joint Applicant's Name _____
Soc. Sec. No. _____ Date of Birth ____/____/____
Address _____ Apt. _____
City _____ State _____ Zip _____
Home Phone (_____) _____ Date of Residence (Mo./Yr.) _____
Joint Applicant's Employer _____ Since? (Mo./Yr.) _____
Bus. Phone (_____) _____ Monthly Gross Salary \$ _____

Joint Applicant's Signature _____

Date _____

FOR MARRIED WISCONSIN APPLICANTS: I acknowledge that the obligation described herein is being incurred in the interest of my marriage or family.

Buyer's Signature _____

Date _____

Z-CARD PRIORITY APPLICATION FAX NUMBER: 612-633-7507

CIRCLE 115 ON READER SERVICE CARD

ZCDJT-PCM-920630

NEW DISPLAY TECHNOLOGIES: Coming Soon to a Screen Near You

by Alfred Poor

While other screen technologies are used for notebooks, laptops, and luggables, the cathode ray tube still reigns supreme for desktop use. From 12-inch to 25-inch displays or larger, CRT technology provides bright, clear images at affordable prices.

There are problems with this technology, however. It takes a thick piece of glass to withstand the partial vacuum inside a monitor's tube, especially in the larger sizes. And the electron-gun design requires that most monitors be at least as deep as they are tall or wide: The 17-inch models in this review, for example, extend around a foot and a half back from the front of the glass. As a result, today's CRTs are big and heavy—quite a contrast to all other computer components, which are getting smaller and lighter.

In the not-too-distant future, however, we may see a downsizing in desktop display technology. A 1,024-by-768 mode, 17-inch color screen that is less than 2 inches thick, light enough to hang on a typical office cubicle partition, and priced well under \$1,000, for example, would fit the bill.

GETTING FROM HERE TO THERE

Although you will not find anything matching these specifications this year, help is on the way. Some of the most popular new technologies, which may someday reach the desktop, are already gaining lots of attention in the portable computer market, where buyers are willing to pay a significant premium for thin and lightweight color displays.

Advances in both passive- and active-matrix liquid crystal display (LCD) technologies have made battery-powered color displays practical on laptops. Some displays are even starting to show up without computers: Sharp Electronics Corp. currently sells 5.6- and 8.6-inch active-matrix flat screen LCD video panels in Japan for use as TV screens or "picture frames" to display electronically stored fine art. Sharp's 8.6-inch screens are also mounted in seat-backs

in Japanese Super Express trains for passenger entertainment. More important, larger-size displays that use this technology are also possible: Sharp recently demonstrated a 16.5-inch wide-vision active-matrix video display panel in Japan. The design is aimed primarily at the HDTV (high-definition television) market, but the company lists computer images as one of the three main applications for the system. Sharp has not specified any release date or pricing for this product as of yet.

Some problems still plague products based on LCD technology, however. One problem with passive-matrix panels is that they respond too slowly to screen changes. Active-matrix panels are faster, but new ferroelectric LCDs are much thinner and offer even faster performance. Although there are still hurdles to overcome in the labs before ferroelectric LCDs enter the market, this new technology may provide a basis, along with active- and passive-matrix designs, for larger and higher-resolution desktop display panels.

OVERCOMING LCDs' LIMITATIONS

All LCDs share one limitation, however: They work by subtracting from light transmitted through the panel by an external light source. In many cases, more than 90 percent of the light is absorbed by the panel, which means that you must provide an extremely bright backlight to get a sufficiently bright image. CRTs have the advantage of creating their own light at the screen's surface by using electron beams to make phosphors glow.

One exciting and different technology has come out of years of research by SRI International, a consulting concern in Menlo Park, California, and is being pursued by many companies

around the world, including Coloray Display Corp. of Fremont, California. The design, called *field emission display* (FED), uses semiconductor construction methods to create "cold cathodes"

that can be induced to emit a stream of electrons. By putting one of these directly behind a phosphor dot, you can make the dot glow. The technique can create a matrix of these emitters in a tiny area, so you

actually can have a hundred emitters per phosphor.

This also avoids one of the biggest problems that can occur with active-matrix LCDs—yield. If the one or two transistors at any location on an active-matrix LCD screen is bad, the panel has to be scrapped. But even if as many as 10 percent of the emitters at any phosphor location on an FED screen are bad, you will not be able to see the difference. And FED panels should be as bright as regular CRTs, but they will be less than an inch or two thick and will draw a small fraction of the power. Additionally, FED panels are characterized by fast response.

Because the FED design relies on existing semiconductor manufacturing techniques and has both much larger tolerances and fewer steps than active-matrix or ferroelectric designs, manufacturing costs for FED panels could ultimately be cheaper than those designs. It is conceivable that we could see small screens (about 5-inch diagonal) based on this technology as early as the end of this year.

Most of these approaches for large format displays are still in the laboratory demonstration stage, but the PC world is hungry for a breakthrough in desktop displays that will match the progress we have seen in CPUs, hard disks, and memory chips. And it looks like we may not have to wait too much longer. ■

In the not-too-distant future, we may see a downsizing in desktop display technology.

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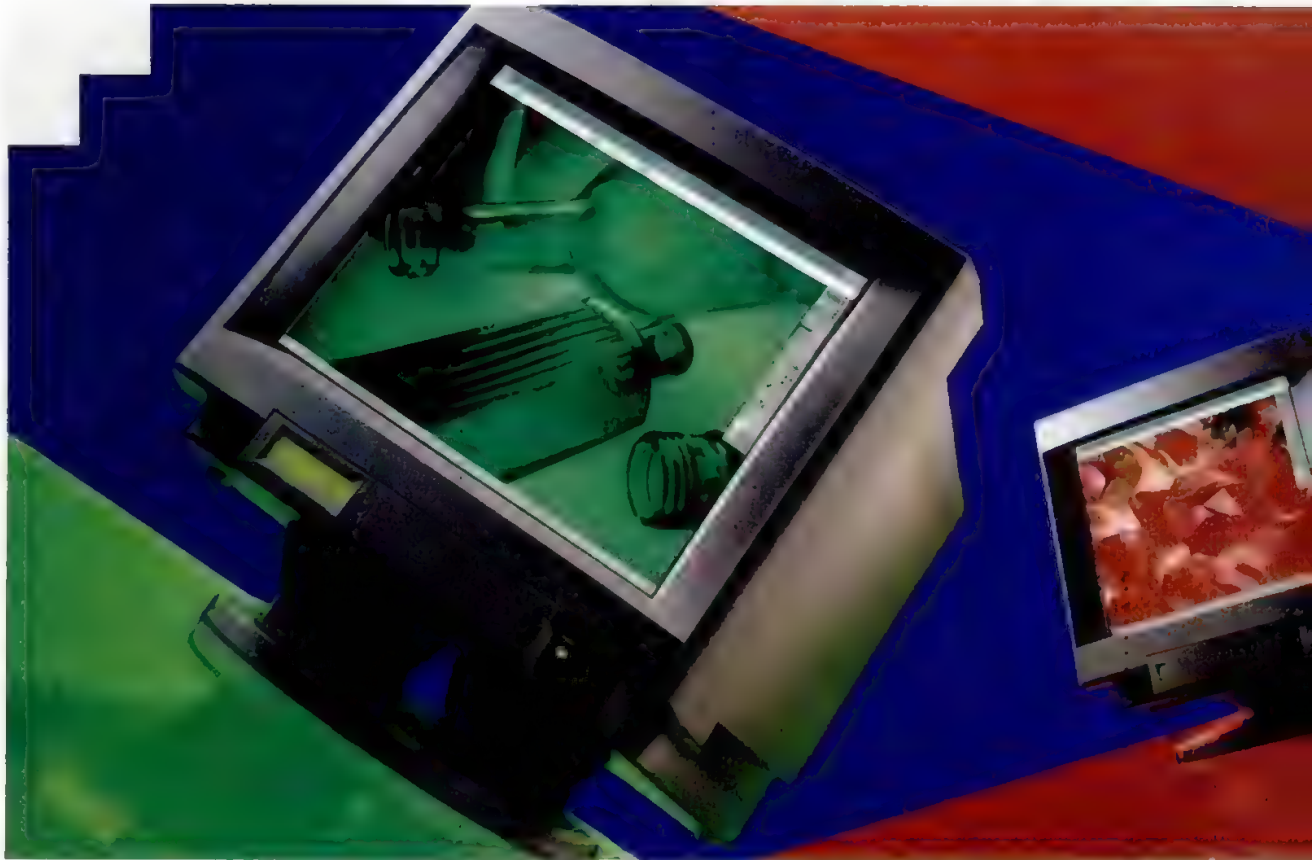


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LISTEN TO THE EXPERTS. Don't just take our word for it. We're partial. Read *PC Magazine's* "Editors' Choice" for July 1991. They said of the MX15F... "clearly the best." Or listen to *PC World* (12/91) rave about the MX17F... "so great that it defies comparison."

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CIRCLE 067 ON READER SERVICE CARD

COVER STORY 17-INCH MONITORS

set display modes from VGA up through 1,024-by-768 noninterlaced and interlaced resolutions. These settings can be modified through the user controls, or you can store up to seven settings of your own. The monitor will compare its signal input first with the default settings, then the user-defined modes, and select the proper one for image size.

When you want to adjust image size and positioning manually, the product offers a control panel on the middle-right side. In addition to power on/off and lockable brightness and contrast dials, another dial switches among six adjustment modes: pincushioning or barrel distortion, keystoneing, and vertical and horizontal size and positioning. (Increment buttons adjust the display either way.)

On our Pincushioning tests, the Epson Professional Series was always within the acceptable ranges, although its Vertical Pincushioning scores pushed toward the outer edges of that limit in both 800-by-600 and 1,024-by-768 modes. But users who spend some time adjusting both the pincushioning and keystoneing controls will find that this model provides a highly maneuverable image shape; this allowed us to get a good on-screen image in subjective testing.

The Epson monitor is backed by a standard 12-month parts-and-labor warranty. A one-year extended warranty can be purchased for \$80. Technical support is free and unlimited, and the toll-free support line is manned weekdays from 6:00 A.M. to 5:00 P.M. P.S.T. Service involves shipment to an authorized Epson service center.

The Epson Professional Series delivers a good selection of features for the price, which you will find discounted to as

low as \$1,150 on the street. You can hardly go wrong with this one.

HEWLETT-PACKARD CO.

HP Ultra VGA 17-Inch Display

by Kellyn Betts

The \$1,449 HP Ultra VGA 17-Inch Display has the most-wanted features of '92: a flat-square picture tube, low-radiation emissions, variable-frequency multiscanning, and antiglare coating. The very reasonable price also includes a tilt/swivel base, a power cable, and a miniDB-15-to-miniDB-15 adapter cable.

The 43-pound HP Ultra offers a 15.8-inch-diagonal viewing area and a 0.28-mm dot pitch. It had no problems displaying the higher 70- and 72-Hz vertical refresh rates the VESA committee recommends for reducing flicker at 1,024-by-768 and 800-by-600 resolutions, respectively. It is even capable of displaying the 1,280-by-1,024 resolution that higher-end cards generate, though at 60 Hz.

In addition to automatically synching on a huge variety of vertical and horizontal scanning frequencies, the monitor's internal microprocessor is able to store optimal image sizes in memory. The three most popular VGA modes, 640-by-480, 800-by-600, and 1,024-by-768, are preset at the factory at their VESA-compatible refresh rates. The ideal sizes of 13 additional frequency combinations can be saved with a touch of the front-panel memory button.

TAKING ITS MEASURE

The monitor's six other image controls are especially easy to use, each with its own digital push buttons. In our testing, this ease of adjustment transformed a good-looking initial image into an excellent one, though a slight amount of horizontal pincushioning was visible during subjective testing (at 800-by-600, the Superspot pegged Horizontal Pincushioning to be within, but on the outer limits of, twice the Horizontal Line Width). The high Line Width Variance score we measured on our tests, however, did not show up at all on subjective visual inspection. Our test for this generates four squares covering the screen with 1-pixel-wide lines. Although the vertical lines were



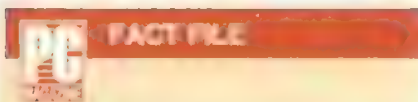
A tendency to swim at 1,024-by-768 resolution at 72 Hz is a slight problem for the \$1,449 HP Ultra VGA 17-Inch Display, but in most other respects, its image quality is quite good.

measured as being far wider than their horizontal counterparts, they sure looked to be the same size. Still, the discrepancy is worth investigating further if you need very square pixels.

The only complaint we can really register about the monitor's image is its tendency to swim at the high vertical refresh 1,024-by-768 resolution, as measured by the Superspot.

Service and support have always been Hewlett-Packard strengths, despite its dealer orientation. The HP Ultra is backed up by a 12-month warranty that allows you to go to your dealer or ship to the manufacturer for service. Technical support is through a toll-free line staffed weekdays 7:00 A.M. to 8:00 P.M. E.S.T. And if you happen to buy this monitor together with an HP 486 PC, you also get a year's worth of free on-site service.

If you are sold on the flat-square approach, the HP Ultra VGA 17-Inch Dis-



Epson Professional Series

Epson America Inc., 20770 Madrona Ave., Torrance, CA 90503; 800-922-8911, 310-782-0770.

List Price: \$1,539.

Requires: VGA or better graphics adapter.

Visible Diagonal Screen Size: 16.3 inches.

In Short: Epson's 17-inch offering gives you plenty for its price, including several factory-set and user-definable modes and versatile controls that include pincushioning and keystoneing. The product is capable of producing a good image and offers a healthy-size 16.3-inch-diagonal image viewing area to display it.

CIRCLE 512 ON READER SERVICE CARD



HP Ultra VGA 17-Inch Display

Hewlett-Packard Co., California Personal Computer Division, 974 E. Arques Ave., P.O. Box 3486, Sunnyvale, CA 94086; 800-752-0900

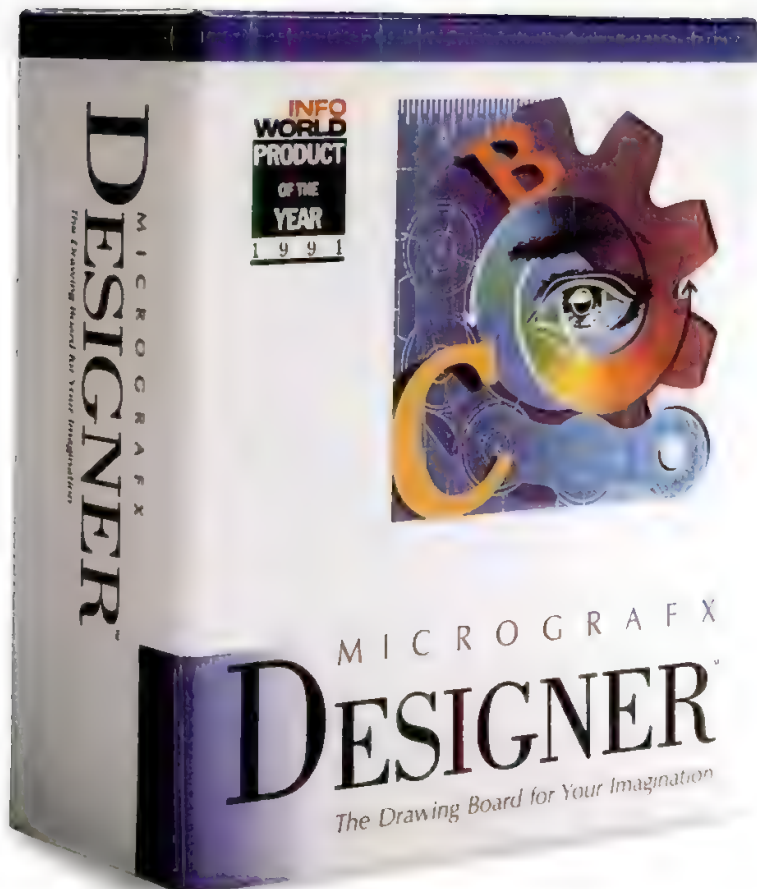
List Price: \$1,449.

Requires: VGA or better graphics adapter.

Visible Diagonal Screen Size: 15.8 inches.

In Short: The HP Ultra VGA 17-Inch Display includes all the trendiest features: a flat square picture tube, low emissions, digital controls, and the ability to store image sizes. The price is also very reasonable, and the company has a reputation for good support. All in all, HP offers an enticing deal.

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Object snap	Yes	No
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Edit in full color	Yes	No
Clip art images	Over 1,700	750
Type 1 fonts	180	0
PageMaker 4.0 filter	Yes	No
On line help screens	Yes	No
24-hour support	Yes	No

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CIRCLE 361 ON READER SERVICE CARD

play is a good deal for the money. That it's backed up by a company with a reputation for quality and service adds to its attractiveness.

IDEK/IYAMA NORTH AMERICA INC.

Idek/Iiyama MF-5317

by Kellyn Betts

The Idek/Iiyama MF-5117 17-inch display wowed us last year, earning our Editors' Choice commendation back when the company was called Idek North America. Despite its similar moniker, Idek/Iiyama North America's \$1,495 Idek/Iiyama MF-5317, which offers a 0.28-mm dot pitch, failed to make such a positive impression.

The Idek/Iiyama MF-5317's main problem stemmed from a cost-cutting measure that prompted the company to eschew the use of microprocessors to control and remember image size and positioning. The traditional active analog circuits hidden behind the monitor's flat-square tube had a difficult time adjusting to the image idiosyncrasies associated with different video cards.

The 40-pound monitor, which includes a tilt/swivel base, achieved its best positioning efforts in the key VESA-recommended 1,024-by-768 resolution at 70 Hz and 800-by-600 resolution at 72 Hz. But even in these modes (two of the four modes the monitor is factory-tuned to automatically sync on) the image seemed to be over-scanned (that is, the edges of the image went beyond the monitor's screen limitations). This made it very difficult to adjust with the five analog thumb-wheel image-positioning controls. The controls for degaussing and adjust-

ing pincushioning worked well enough, as did the ones for brightness and contrast.

At the lower vertical scanning frequencies for these resolutions, such as 60 Hz for 800-by-600, the monitor—which labels itself a variable-frequency multiscan design—has serious difficulties recognizing exactly where images begin on its 16.2-inch-diagonal image display area. As a result, many were positioned inappropriately in places where some of the controls had no effect. The company says it uses a Diamond SpeedSTAR to tune the images in its factory, while our test-bed used a VGA Wonder XL Series card, from ATI Technologies. Idek/Iiyama says these problems can be minimized by using the Tseng-based Diamond SpeedSTAR, which bundles a utility for customizing the display to work with the monitor to which it is attached. But it is certainly asking a lot of users to change video cards to resolve the issue.

OTHER PROBLEMS

Positioning proved to be but one of a number of image problems. There was a visible area of bloom at both the VESA test scanning frequencies, which disappeared at lower vertical refresh rates, indicating that the monitor may have been over-driven. Despite the double-focusing lens inside the monitor, convergence problems were visible to the naked eye, but did not register on the PC Labs' Superspot. The Superspot did measure an alarmingly high Swim Ratio at 800-by-600, however. Line Width Variance measurements were also not impressive.

These difficulties pretty much exclude the present form of the Idek/Iiyama MF-5317 for all but the most intrepid Diamond SpeedSTAR owners (and perhaps even them), but many of its other features are laudable. It comes with BNC signal input connectors as well as the standard miniDB-15 RGB analog plug, and the BNC input voltage can be adjusted between 1.0 and 0.7 volts. You get a BNC-5-to-miniDB-15 adapter cable in the package, along with the power cable. BNC-4 to miniDB-15 cables are \$65 options.

Idek/Iiyama also offers the Idek/Iiyama MF-5217 17-inch monitor (\$1,345), as well as the previously reviewed Idek/Iiyama MF-5117 (\$1,295). These others have a lower 55-MHz bandwidth, and



FACT FILE

Idek/Iiyama MF-5317

Idek/Iiyama North America Inc., 650 Louis Dr., #120, Warminster, PA 18974; 215-957-6543.

List Price: \$1,495.

Requires: VGA or better graphics adapter.

Visible Diagonal Screen Size: 16.2 inches.

In Short: The Idek/Iiyama MF-5317 has little to recommend it to most users. We experienced serious image-positioning problems and measured an alarmingly high Swim Ratio in 800-by-600 resolution. There are better buys than this.

CIRCLE 614 ON READER SERVICE CARD

none can display the high 1,280-by-1,024 resolution of which the Idek/Iiyama MF-5317 is capable. All the products feature low-radiation emissions and come with Idek/Iiyama's one-year parts-and-labor warranty, backed up by toll-free technical support weekdays from 8:30 to 5:00 E.S.T.

There's not much to recommend this monitor to users. There are plenty of other options reviewed here that are better worth your time and money.

MAG INNOVISION INC.

MAG MX17F

by Alfred Poor

In a crowded field of look-alike monitors with similar features and performance, MAG Innovision's \$1,549 MAG MX17F stands out. It combines some unusual features with an excellent image and a competitive price to create an appealing combination.

The price of the product includes a tilt/swivel base, a power cable, and an adapter cable. The most striking feature is a backlit LCD message window at the lower-left corner of the screen. The messages in the window indicate the resolution and timing mode in use at that moment. For example, under a standard VGA mode the window will show, "Standard VGA 640 x 350 70 Hz," but with a high-resolution Windows driver the message will be, "Non-Interlaced 1024 x 768 70 Hz." This information is presented in simple terms, which makes it easy to diagnose the current settings quickly and without resorting to any external measuring devices. (For our tests, however, we did use an external meter to verify the information on this monitor as well as all the others.)

Like many of the monitors in this review, the 50-pound MAG MX17F uses



The \$1,495 Idek/Iiyama MF-5317 suffered from serious image positioning problems.

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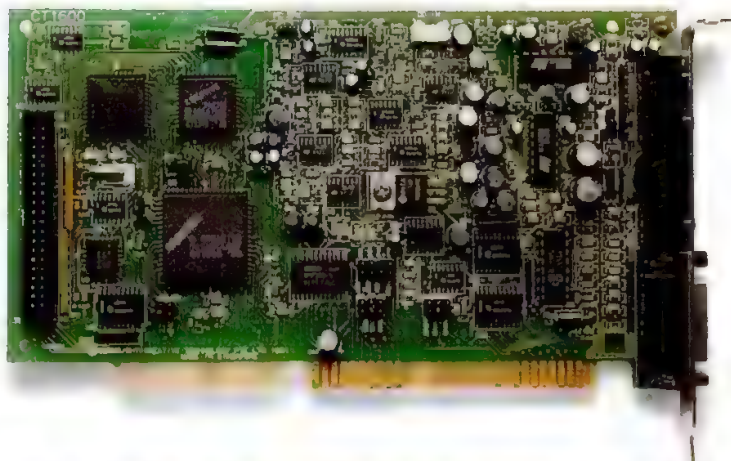
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CIRCLE 086 ON READER SERVICE CARD



The \$1,549 MAG MX17F displayed an excellent image, with only slight convergence problems. The sharp image is due mostly to the monitor's 0.26-mm dot pitch.

digital controls for the picture size and position. Each has its own pair of buttons, such as left/right, up/down, and larger/smaller. The microprocessor-equipped monitor comes with 13 preprogrammed settings (8 can be user-defined) that cover most PC and Mac images, up to and including a 1,280-by-1,024 high-resolution mode. That highest mode can only manage a 60-Hz vertical refresh rate, but the lower resolutions were perfectly able to handle our VESA requirements for 70 Hz at 1,024-by-768 and 72 Hz at 800-by-600.

IMAGE QUALITY

The product uses a shadow mask made of Invar attached to a flat-square screen. The image on the screen was generally excellent, with only two exceptions. In subjective testing, there were some slight convergence problems, the worst of which was the blue beam being a bit high and wide in the upper left-hand corner. The Superspot picked this up in our Vertical-Line Convergence test, where the monitor was just a shade over PC Magazine Labs' recommended 8 mils in both modes. In general, however, these problems were not at all visible at normal viewing distances.

The vertical lines were noticeably thicker than the horizontal lines (the Superspot also picked up the discrepancy), when they should appear to have the same thickness. On the other hand, the MAG MX17F had the best Vertical Pincushioning measurements of the group on our tests and offered a stable image on its 15.5-inch-diagonal viewing area.

Subjectively, the pictures on the etched

COVER STORY 17-INCH MONITORS

screen looked sharp as a tack. One reason for this was the fact that the monitor has a surprisingly fine 0.26-mm dot pitch: This is smaller than many competing screens, giving the image a finer grain. The monitor comes with a DB-15-to-miniDB-15 cable, which can be used to attach the monitor to either a Mac or a PC. But for best results, you will want to take advantage of the \$25 BNC-5-to-miniDB-15 cable; the BNC connectors offer a higher bandwidth and should therefore give a better image. The variable-frequency multiscan monitor is rated at a 120-MHz bandwidth—higher than most competitors—which further explains the sharp images on the screen. The system supports vertical scanning frequencies from 50 Hz to 120 Hz, and horizontal scanning frequencies from 30 kHz to 68 kHz.

The company also offers a similar model, the MAG MX17S, for \$1,749; the difference is that the MAG MX17S uses a Trinitron tube. While that option is worth investigating, there is so much to like about the monitor we reviewed that you will not be making a mistake to choose it. In addition to the wealth of features mentioned here, you can also use the extra DB connector on the back as a video pass-through to connect a second monitor (though this is not documented). But even without these extras, the MAG MX17F's sharp image and competitive price make it a compelling choice in its field.

FACT FILE EDITORS' CHOICE

MAG MX17F

MAG Innovation Inc., 4392 Corporate Center Dr., Los Alamitos, CA 90720; 800-827-3998. 714-827-3998

List Price: \$1,549.

Requires: VGA or better graphics adapter.

Visible Diagonal Screen Size: 15.5 inches.

In short: The MAG MX17F produces excellent image quality and includes some innovative features for an aggressively competitive price, making it a top contender in its field.

CIRCLE 616 ON READER SERVICE CARD

MITSUBISHI
ELECTRONICS AMERICA INC.

Mitsubishi Diamond Pro 17

by Kellyn Betts

With the \$1,720 Mitsubishi Diamond Pro 17, Mitsubishi Electronics America continues in its tradition of building highly programmable monitors. In addition to a full set of image controls, the Diamond Pro 17 adds its own implementation of color matching.

The beauty of Mitsubishi's programmable line of monitors is that you do not have to use their special features. You

*Subjectively, the
pictures on MAG's
etched screen looked
sharp as a tack.*

need never enter into the complicated world of the Enhanced Adjustment Mode to get a good picture on the Trinitron-based Diamond Pro 17. Thanks to microprocessor-based image control, all you need to do to install this monitor

is plug it into your video card and power outlet. A variable-frequency multiscan monitor, the Diamond Pro 17 can synch on resolutions up to 1,280-by-1,024. Seven image settings are preset at the factory; up to five image settings are user-programmable.

A PLETHORA OF CONTROLS

For the more demanding user, the latest and greatest version of Mitsubishi's Enhanced Adjustment Mode (the Diamond Pro features a brand new microprocessor in charge of these adjustment duties) is accessed very similarly to many dot matrix printer's extended features. You power-on the monitor while at the same time pressing one of its six image control buttons to get into that mode. You then follow the directions in the manual—laconic but amply illustrated—to learn what the new functions of the LED lights and front-panel buttons are.

Once there, you can tweak your monitor's degree of convergence or pincushioning and alter some more esoteric elements, such as PCC-phase, key balance, and pin balance (otherwise known as the tendency to produce keystone, trapezoidal, or asymmetrically pushed-out shapes).

COVER STORY 17-INCH MONITORS



The \$1,720 Mitsubishi Diamond Pro 17 is highly programmable and offers a good image, but it had some convergence problems at the extreme periphery of the image.

You can also adjust the color balance by accessing the Gain Controls for the monitor's red, green, and blue electron guns. Mitsubishi counsels that these adjustments should be made with the aid of a professionally trained eye or a Minolta Color Analyzer. (For more information about the limits of monitor-based color matching, see the sidebar "Matching Color at Gunpoint.")

A 10-minute session in the Enhanced Adjustment Mode allowed us to improve on an already good image, but even after fine-tuning, it was not the best in this roundup. In its favor, the monitor boasts a 0.26-mm aperture grille pitch, which contributes to a sharper image. On the 15.8-inch-diagonal viewing area, however, we observed some convergence problems on our subjective tests at the extreme periphery of the image at both

800-by-600 and 1,024-by-768 resolutions, though the center held sharp as a tack. On subjective tests, there was also slight horizontal pincushioning at both resolutions, although the Superspot showed Horizontal Pincushioning to be greater than twice the horizontal line width in 800-by-600 mode only. At 800-by-600, in particular, the Line Width Variance indicates that pixels would be noticeably off-square, but that's pretty much to be expected in a Trinitron design.

The 35-pound monitor, fairly light in comparison to many of its peers, includes a tilt/swivel base, a power cable, and a miniDB-15-to-miniDB-15 adapter cable in the cost. In the area of service and support, Mitsubishi's 24-month warranty is noteworthy. And though it's backed up by relatively few hours of toll-free technical support (weekdays from 8:00 to 4:30 P.S.T.), Mitsubishi says the hours are slated to increase greatly in the near future. On-site service is available for an extra fee.

With a large selection of image controls, a generous warranty, and a good image (though not as good as those on flat-square tubes), the Mitsubishi Diamond Pro 17's main drawback is a high list price. If it's beyond your budget, though, you can always turn to the Mitsubishi Diamond Scan 16, which sells for \$1,499 and offers a similar set of features.

NANAO USA CORP.

Nanao Flexscan F550i

—by John R. Quain—

The Nanao Flexscan F550i, from Nanao USA Corp., will deliver excellent performance at Super VGA resolution. But to really appreciate its abilities, the \$1,749 Flexscan F550i needs to be pushed to a higher 1,024-by-768 resolution, where its razor-sharp accuracy and tight focus truly shine.

The 17-inch F550i boasts all the features expected of a high-end monitor: low-emission MPR II compliance, a non-glare, anti-static coated flat-square screen, and an internal microprocessor that can store up to 23 user-defined settings (for features such as brightness and contrast as well as image size). The monitor also includes nine factory presets covering VESA, IBM 8514/A, and Macintosh II



The \$1,749 Nanao Flexscan F550i's screen is not as bright as some of the competing screens, but this was a conscious decision by the company to keep the image tightly focused. Image quality is excellent.

image size display modes. The system ships with a tilt/swivel base, a power cable, and a miniDB-9-to-miniDB-15 connector. A BNC cable connector is available for \$69.

The 0.28-mm dot-pitch Flexscan F550i is based on a flat-square Mitsubishi cathode ray tube. The system relies on a conventional shadow mask. Nanao has fine-tuned the tube to provide a maximum noninterlaced resolution of 1,280 by 1,024 pixels at a 60-Hz vertical refresh rate. At 1,024-by-768 resolution the Flexscan F550i can exceed the VESA 72-Hz vertical refresh rate to deliver a more ergonomic rate of 75 Hz. Its variable-frequency multiscanning capability covers vertical scanning frequencies from 55 Hz to 90 Hz and horizontal scanning frequencies from 30 kHz to 65 kHz. It is rated at an 80-MHz video bandwidth.

The unit offers a 15.8-inch-diagonal image display area. On our Superspot tests, in Super VGA 800-by-600 resolution at 72 Hz, the Flexscan F550i delivered the narrowest average Horizontal Line Width and one of the narrowest average Vertical Line Width scores—testament to the display's excellent beam focus. Its Vertical-Line Convergence scores at this resolution, though not the very best, were close to the top. Under Microsoft Windows, it yielded even color intensity and no bright hot spots.

At a 1,024-by-768 resolution, the Flexscan F550i's full potential is realized. Its remarkably consistent and narrow Horizontal and Vertical Line Width scores are matched by even intensity and brightness, so Windows borders remain ruler-

PC FACT FILE

Mitsubishi Diamond Pro 17

Mitsubishi Electronics America Inc.,
Information Systems Division, 5757 Plaza Dr.,
P.O. Box 6007, Cypress, CA 90630; 800-843-
2515.

List Price: \$1,720.

Requires: VGA or better graphics adapter.

Visible Diagonal Screen Size: 15.8 inches.

In Short: The beauty of the Trinitron-based Mitsubishi Diamond Pro 17 is the high degree of control it affords the fussy viewer. You can fiddle with almost every conceivable aspect of picture geometry and color balance, though the picture will never be as good as those of the best flat square tubes. The generous two-year warranty is also notable, but the high list price is a drawback.

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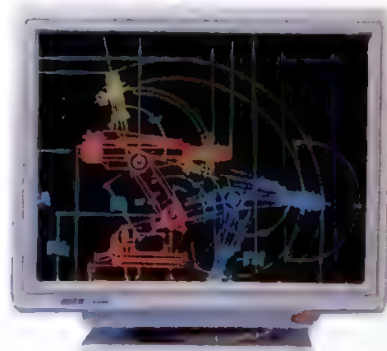
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Model	H. Frequency	Dot	Resolution
MF-5017	15 to 40kHz	.31	1024 x 768
MF-5117	20 to 50kHz	.28	1024 x 768
MF-5217	30 to 57kHz	.28	1024 x 768
MF-5317	30 to 65kHz	.28	1280 x 1024

MULTIFLAT Series (21" Flat CRT Monitors)

Model	H. Frequency	Dot	Resolution
MF-5021	15 to 38kHz	.31	1024 x 768
MF-5121	21 to 50kHz	.31	1024 x 768
MF-5221A	30 to 80kHz	.31	1280 x 1280
MF-5321A (A/R Panel)	30 to 80kHz	.31	1280 x 1280
MF-5421A (A/R Panel)	30 to 80kHz	.26	1600 x 1280

IDEK
Iiyama

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Overseas Division

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Tokyo 102, Japan
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IYAMA Europe B.V.

Avio Trade Park, fase 6; Kruisweg 587
2132 NA Hoofddorp, The Netherlands
Phone: (31) 20 653-0797 Fax: (31) 20 653-0800

IYAMA North America Inc.

650 Louis Drive, Suite 120, Warminster, PA 18974 U.S.A.
Phone: (1) 215-957-6543 Fax: (1) 215-957-6551

COVER STORY

17-INCH MONITORS

SUMMARY OF FEATURES

Products listed in alphabetical order

—Editors' Choice
☒ Yes ☐ No

	AcerView 76	American Miliac M1758	CTX-1760	Epson Professional Series	HP Ultra VGA 17-Inch Display	Idek/Iiyama MF-5317	MAG MX17F
List price	\$1,099.00	\$999.00	\$1,399.00	\$1,539.00	\$1,449.00	\$1,495.00	\$1,549.00
Dimensions (HWD, in inches)	16 x 17 x 18	15.3 x 15.8 x 16	17 x 16.5 x 16.4	15.5 x 16.4 x 17.4	16.8 x 16.3 x 17	16.4 x 15.8 x 16.3	16.5 x 16.5 x 19.9
Weight (pounds)	42.0	44.0	52.0	55.0	43.0	40.0	50.6
Length of power cable (inches)	72	72	70	73	72	72	64
SIGNAL COMPATIBILITY							
1,280 x 1,024	☐	☐	☒	☐	☒	☒	☒
1,024 x 768 noninterlaced	☒	☒	☒	☒	☒	☒	☒
1,024 x 768 interlaced	☒	☒	☒	☒	☒	☒	☒
Super VGA (800 x 600)	☒	☒	☒	☒	☒	☒	☒
VGA (640 x 480)	☒	☒	☒	☒	☒	☒	☒
MCGA	☒	☐	☐	☐	☐	☐	☒
EGA	☒	☐	☐	☐	☐	☐	☐
CGA	☒	☐	☐	☐	☐	☐	☐
MDA	☒	☐	☐	☐	☐	☐	☐
Hercules	☒	☐	☐	☐	☐	☐	☐
Mac II	☒	☐	☐	☒	☐	☒	☐
Apple II GS	☒	☐	☐	☒	☐	☐	☐
OPERATIONAL FEATURES							
Maximum noninterlaced resolution (pixels)	1,024 x 768	1,024 x 768	1,024 x 768	1,024 x 768	1,280 x 1,024	1,280 x 1,024	1,280 x 1,024
Video bandwidth (MHz)	80	85	100	70	85	60	120
Vertical scanning frequency range (Hz)		50-90	50-90	50-90	50-90	50-90	50-90
Horizontal scanning frequency range (kHz)	31-60	31.5-58	30-65	30-57	30-64	30-65	30-68
Maximum vertical refresh rates (Hz):							
1,280 x 1,024	N/A	N/A	60	N/A	60	61	60
1,024 x 768 (noninterlaced)	72	70	70	70	70	72	76
800 x 600	72	72	72	72	72	72	85
Phosphor persistence	Medium-short	Medium-short	Medium-short	Medium-short	Medium-short	Short	Medium-short
Dot pitch or aperture grill pitch (mm)	0.31	0.31	0.31	0.26	0.28	0.28	0.26
INPUT CONNECTORS							
Analog D-sub connectors:							
9-pin mini	☐	☒	☐	☐	☐	☐	☐
15-pin mini	☒	☐	☒	☐	☒	☐	☒
15-pin standard	☐	☐	☒	☐	☐	☒	☒
Analog BNC coaxial connectors:							
3-wire synch on green	☐	☐	☐	☒	☐	☐	☐
4-wire external composite synch	☐	☐	☐	☐	☐	☐	☒
5-wire external composite synch	☐	☐	☐	☐	☒	☒	☒
CONTROLS							
Brightness	Analog	Analog	Analog	Analog	Digital	Analog	Analog
Contrast	Analog	Analog	Analog	Analog	Digital	Analog	Analog
Color matching	None	None	None	None	None	None	None
Horizontal position	Analog	Analog	Digital	Analog	Digital	Analog	Digital
Vertical position	Analog	Analog	Digital	Analog	Digital	Analog	Digital
Horizontal size	Analog	Analog	Digital	Analog	Digital	Analog	Digital
Vertical size	Analog	Analog	Digital	Analog	Digital	Analog	Digital
Pincushioning	Analog	None	None	Analog	None	None	None
Barrel distortion	None	None	None	Analog	None	Analog	None
Overscan	None	None	None	None	None	Analog	None
Underscan	None	None	None	None	None	Analog	None
Degaussing	☐	☐	☐	☐	☐	☒	☒
120-240-volt switching	☒ (auto-sensing) ☒ (switch)	☒ (auto-sensing) ☒ (switch)	☒ (auto-sensing) ☒ (switch)	☒ (auto-sensing) ☒ (switch)	☒ (auto-sensing) ☒ (switch)	☒ (auto-sensing) ☒ (switch)	☒ (auto-sensing) ☒ (switch)
MISCELLANEOUS							
Fixed- or variable-frequency multiscan	Fixed	Variable	Variable	Variable	Variable	Variable	Variable
Low-emissions model	☐	☐	☐	☐	☒	☒	☐
VLF radiation control	N/A	N/A	N/A	N/A	☒	☒	N/A
ELF radiation control	N/A	N/A	N/A	N/A	☒	☒	N/A
FCC certification class	A	B	B	B	B	A	B

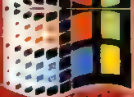
N/A—Not applicable: The product does not have this feature

COVER STORY

17-INCH MONITORS

Mitsubishi Diamond Pro 17	Nanao Flexscan F5501	NEC MultiSync 5FG	Relisys RE1776 17-Inch High Resolution Multiscan Color Monitor	Seiko CM1760LR	Sony CPD-1604S 17" Multiscan Trinitron Color Computer Monitor	Tatung CM-17MBD	Toshiba P17CM01	ViewSonic 7
\$1,720.00	\$1,749.00	\$1,699.00	\$1,495.00	\$1,599.00	\$1,789.95	\$1,599.00	\$1,900.00	\$1,399.00
15.8 x 15.8 x 17	16 x 15.8 x 17.8	18 x 16.5 x 20	17 x 16.5 x 16.3	17 x 16 x 17	16.8 x 15.9 x 17.3	16.8 x 16.2 x 16.5	16.6 x 15.8 x 18.3	16.8 x 16 x 18.7
35.0	42.0	56.1	55.0	51.0	48.4	44.0	57.2	60.5
90	82	72	48	73	84	90	74	60
■	■	■	■	■	□	■	■	■
■	■	■	■	■	■	■	■	■
■	■	■	■	■	■	■	■	■
■	■	■	■	■	■	■	■	■
┘	■	■	■	■	■	■	■	■
┘	┘	■	□	□	■	■	□	■
□	┘	■	□	□	□	□	□	□
□	┘	■	□	□	□	□	□	□
┘	┘	■	□	□	□	□	□	□
■	■	■	■	■	■	■	■	■
┘	┘	┘	□	□	□	□	□	┘
1,280 x 1,024	1,280 x 1,024	1,280 x 1,024	1,280 x 1,024	1,280 x 1,024	1,024 x 768	1,280 x 1,024	1,280 x 1,024	1,280 x 1,024
100	80	135	125	100	60	100	100	110
50-120	50-130	55-90	55-90	40-120	50-90	50-87	50-90	50-90 50-90
30-64	30-65	27-79	30-76	31-64	28-57	29-66	30-65	30-64
60	60	74	60	60	N/A	60	60	60
80	78	88	70	78	70	76	80	72
72	72	90	72	72	72	72	90	72
Medium-short	Medium-short	Medium-short	Medium-short	Medium-short	Medium-short	Medium-short	Short	Short
0.26	0.28	0.28	0.26	0.25	0.25	0.26	0.31	0.28
□	■	□	□	□	□	□	□	□
■	□	■	□	□	□	■	■	■
□	□	■	□	■	■	■	□	□
┘	■	■	■	■	□	■	■	■
┘	■	■	□	■	□	■	■	■
┘	■	■	■	□	┘	■	■	■
Digital	Digital	Digital	Analog	Analog	Analog	Analog	Analog	Analog
Digital	Digital	Digital	Analog	Analog	Analog	Analog	Analog	Analog
Digital	None	Digital	None	None	None	None	None	None
Digital	Digital	Digital	Analog	Analog	Analog	Digital	Digital	Digital
Digital	Digital	Digital	Analog	Analog	Analog	Digital	Digital	Digital
Digital	Digital	Digital	Analog	Analog	Analog	Digital	Digital	Digital
Digital	Digital	Digital	None	None	None	Digital	Digital	None
Digital	Digital	Digital	None	None	None	None	None	None
None	None	Digital	None	None	None	None	None	None
None	Digital	Digital	None	None	None	None	None	None
■	■	■	■	□	□	■	■	■
■ (auto-sensing)	■ (auto-sensing)	┘	■ (auto-sensing)	┘	■ (auto-sensing)	■ (switch)	■ (switch)	■ (auto-sensing)
Variable	Variable	Variable	Variable	Variable	Variable	Variable	Variable	Variable
■	■	■	□	■	■	□	■	■
■	■	■	N/A	■	■	N/A	■	■
■	■	■	N/A	■	■	N/A	□	■
A	A	A	B	A	B	B	A	B

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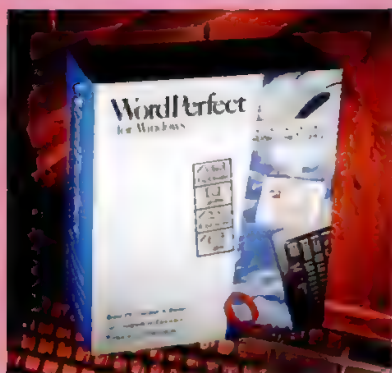


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\$539

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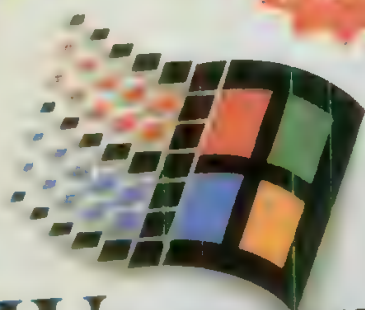
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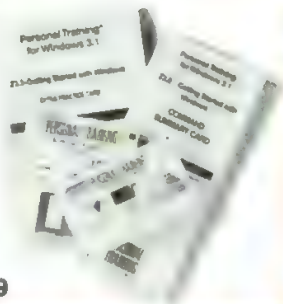
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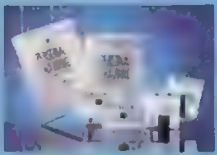
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Memory	
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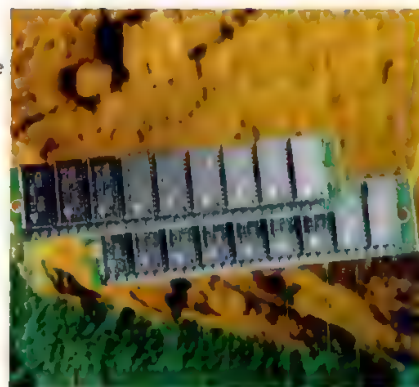
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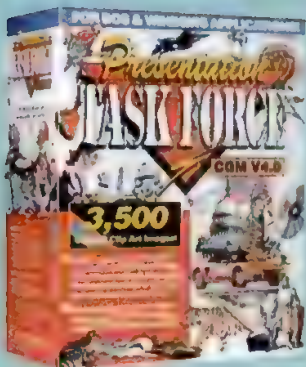
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\$29

MATCHING COLOR AT GUNPOINT

In an attempt to keep printed output in line with scanned-in originals, monitors from companies like Mitsubishi and NEC now provide color-matching features. The question is, How well do these features do the job?

by Lori Grunin

When Microsoft shipped Version 3.0 of Windows, a flood of true-color applications soon followed, inciting some industry analysts to declare the PC a viable platform for high-end graphics work. Of course, *high-end* is a chameleon-like term whose meaning changes depending upon the technology context. In graphics work, one of the most important characteristics of a high-end system is its sufficiency for color-critical applications: those where the quality of the color output is crucial to the success or failure of the venture.

One thing is clear: Developers of PC hardware and software are working furiously to bring the PC up to par with those other microprocessor-based platforms, primarily the Macintosh. But one of the most important problems facing all platforms used for color-critical work is *color matching*.

WYSITWIRL

When it comes to matching colors, WYSIWYG gives way to WYSITWIRL: What You See is Totally Worthless in Real Life. Unfortunately, space precludes the book-long discourse required for an adequate discussion of the difficulties of color matching. Suffice it to say that passing an image from an input device (such as a scanner) into

a computer, editing it while displaying it on a monitor, and printing it on a color output device is like playing Telephone: The colors change a bit at every step in the process, until the end result bears very little resemblance to the original.

The most obvious reason for color shift is the disparate capabilities of various output devices, which tend to differ in color *gamut* (a computer display, for instance, can show more colors than a printer can output) and color *space* (colors change slightly when you convert from RGB to CMYK). More subtle reasons for colors appearing differently on different media include lighting conditions, the characteristics of human color vision, and the properties of the medium itself (paper is reflective, for instance, while monitors are transmissive).

Color matching is a catchall term describing the many methods used to try to compensate for the different capabilities and characteristics of each of the devices in the process, including the human visual system, so that the original and the final versions look the same.

Serious color matching requires a cool hand, a keen eye, and the right equipment. Three monitor vendors—NEC Technologies, Mitsubishi Electronics America, and Everex Systems (in the PRO Series, a forthcoming product originally manufactured by NEC)—are offering a time- and money-saving solution to one of the many variables in the color-matching equation. (We review the NEC MultiSync 5FG and the Mitsubishi Diamond Pro 17 color-matching monitors in the main story.)

All three of these monitors offer front-panel hardware controls for individually adjusting the intensity of the red, green, and blue electron beams in the display. The two implementations differ cosmetically: While NEC provides a full-blown, on-line color tutorial and guide to its AccuColor system, Mitsubishi gives you almost no help at all. Both allow you to save your settings for future use as well.

NOT FOR EVERYONE

This ability to change the RGB intensities from the front panel is notable pri-

marily because previously the same adjustment required having a technician open up the monitor—an expensive proposition. This feature alone, however, is insufficient for color matching.

In the hands of a novice, such power can result in wildly unbalanced colors and boundless frustration. (The frustration comes from the difficulty of shooting at a moving target: When adjusting the intensities, changing one color automatically changes the others.) In the hands of an expert, however, this capability can be a useful tool when combined with other hardware and software designed for color matching. For instance, the *white point* of the monitor—the temperature in Kelvin of the device's true white—can be changed to match that of another display device (such as a television set). In order to match white points, you first need to measure them with a device such as Sequel Imaging's \$1,495 System Calibrator, which measures and feeds the data into the PC, usually via a specially equipped graphics adapter like Matrox's Illuminator series.

Simply altering the color intensities in the display does not appropriately compensate for the differing gamuts of the display and the output devices. For that, you may need special software referred to as a color-management system; these include EFI's *EfiColor* and Kodak Electronic Printing System's *Precision Color Management System*, both slated to ship this year. Color-management systems optimally calculate the translations between color spaces such as RGB and CMYK.

Those doing non-color-critical work who opt for the NEC MultiSync 5FG should definitely work their way through the AccuColor tutorial; it's short and informative. If you need real color-matching power, the adjustment capabilities of either one of these monitors will probably serve you equally well; just remember that the calibration and matching will require further equipment purchases or a consultation with a professional. ■

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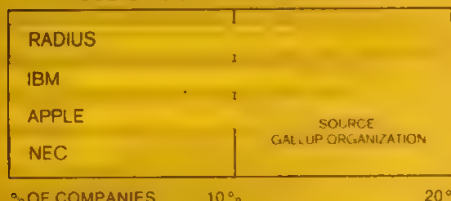
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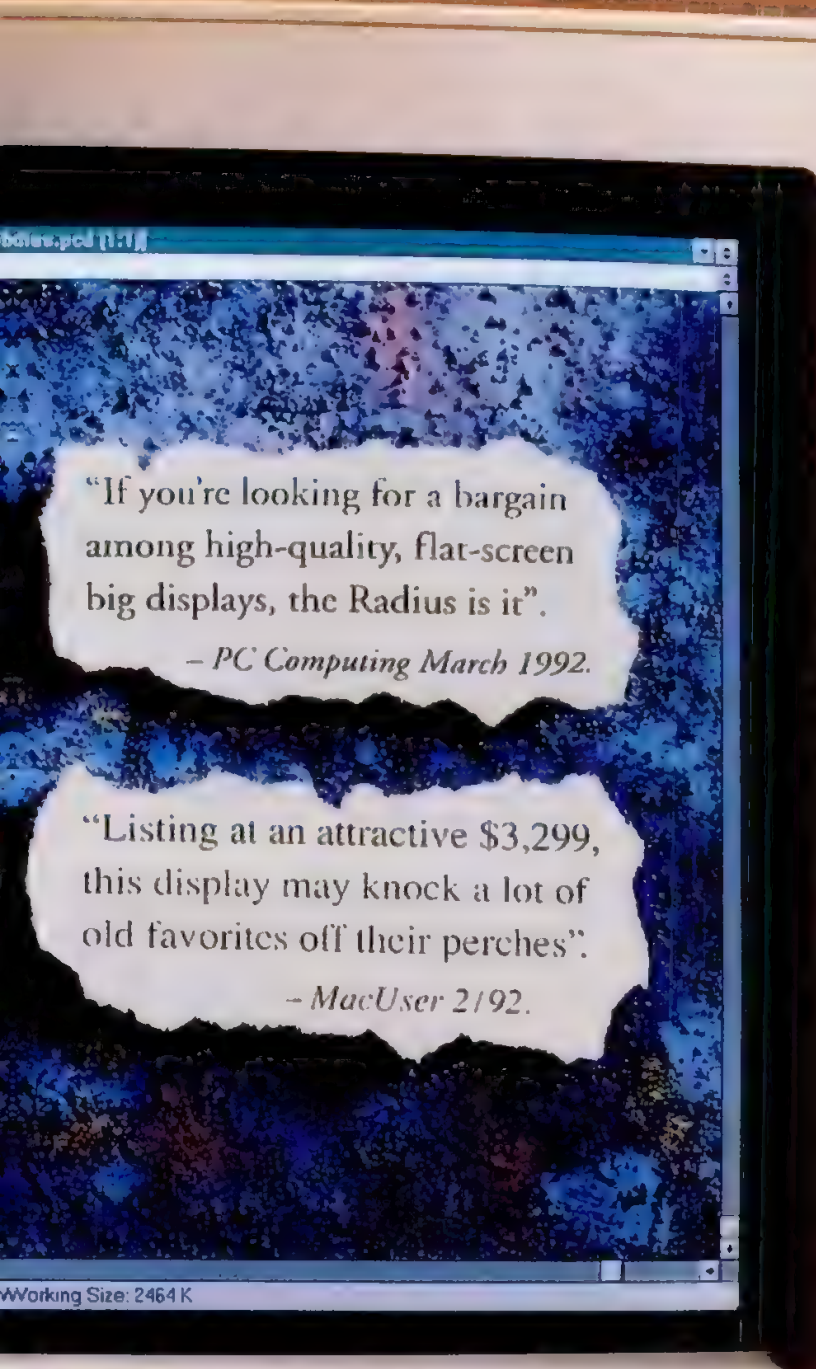
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Yes, it's ironic that the most sophisticated and advanced PC display comes from a company that used to specialize only in Mac graphical user interfaces for the past six years. But it's not surprising. Especially if you look at the full line of Radius PC display systems products including the PCD/19," the color Full-Page Pivot," the paper white Two-Page Display" and the SVGA MultiView" and MultiView 24" Interfaces.

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COVER STORY 17-INCH MONITORS



Nanao Flexscan F550i

Nanao USA Corp., 23535 Telo Ave., Torrance, CA 90505; 800-800-5202, 310-325-5202.

List Price: \$1,749.

Requires: VGA or better graphics adapter.

Visible Diagonal Screen Size: 15.8 inches.

In Short: If image accuracy is your overriding concern, look no further than the Nanao Flexscan F550i. Its performance is nearly unparalleled in this group of 17-inch monitors. With BNC and VGA inputs, 23 user-definable mode settings, and a sharp image, the Nanao Flexscan F550i is one of the most responsive models on the desktop.

CIRCLE 517 ON READER SERVICE CARD

straight. Though Vertical Pincushioning scores exceeded twice the Vertical Line Width, no pincushioning was noticeable to the naked eye. Additionally, Horizontal Pincushioning test results in this mode were far and away better than the rest of the pack (only the NEC MultiSync 5FG approached the consistency of the Flexscan F550i).

DESIGN DECISIONS

Some users will notice that the Flexscan F550i does not appear as bright as other displays in this roundup. This is a conscious design decision that enables Nanao to keep the image tightly focused; other manufacturers trade some accuracy for brightness. Consequently, the Flexscan F550i's transient response is excellent, exhibiting none of the blooming and color bleeding witnessed on some brighter monitors.

One of the more unusual features of the 42-pound Flexscan F550i is its multifunction front-control panel. A row of membrane buttons allows you to choose among pincushion, brightness, and contrast controls, as well as vertical and horizontal size and position adjustments. Once you make a selection, actual adjustments are made using a single digital dial control. The arrangement works well, and there are separate buttons for degaussing and switching between BNC and VGA inputs.

Nanao supports its monitors with a toll-free technical support line (weekdays from 8:30 to 5:00 P.S.T.) and a one-year parts-and-labor warranty. The Flexscan F550i has not been around long enough to establish street prices, but expect dealer discounts around 20 percent. Monitor shoppers should also ask for the latest Flexscan F550i model, as Nanao plans to

add color control to the model without increasing the price. If your monitor dreams have no price ceiling, Nanao also offers a Trinitron-based 17-inch Nanao T560i for \$2,699. For users on more of a budget, the company's 16-inch model, the Nanao Flexscan 9080i, is available for \$1,599 (see our review of 16-inch monitors in the March 26, 1991, issue).

Though costly, the Flexscan F550i presented itself as one of the most capable and feature-rich monitors in this roundup. If you are looking for the ultimate in 17-inch displays, the Nanao Flexscan F550i should be on your list.

NEC TECHNOLOGIES INC. NEC MultiSync 5FG

by John R. Quain

More than any other monitor maker, NEC Technologies sets the standards that others follow. From its sleek, angular Frog-design chassis to its digital color-matching capability, the \$1,699 17-inch NEC MultiSync 5FG is a successful heir to this tradition.

A member of the MultiSync FG family NEC introduced last fall, the MultiSync 5FG's display, with its 15.3-inch-diagonal measured viewing area, uses a 0.28-mm dot pitch, flat-square CRT with an Invar shadow mask. The system ships with a tilt/swivel base and meets MPR II VLF and ELF emissions standards.

The monitor employs full digital controls and a microprocessor to store 13 factory default image size settings and 26 user-definable ones, as well as two user-definable settings and one factory preset for features such as contrast and brightness. Concealed behind a flip-down front panel, controls include brightness, contrast, pincushioning and barrel distortion correction, horizontal and vertical size and position, degaussing, and color matching.

In addition to providing the VESA standard 1,024-by-768 resolution at a 70-Hz vertical refresh and Super VGA 800-by-600 resolution at 72 Hz, the MultiSync 5FG will produce a noninterlaced 1,280-by-1,024 image at an ergonomic 74-Hz refresh rate. The MultiSync 5FG offers variable-frequency scanning across its 55-Hz to 90-Hz vertical and 27-kHz to 79-kHz horizontal scanning frequency

range. It is rated for a high 135-MHz video bandwidth.

Connections on the back panel include a mini D-sub 15-pin VGA input, a standard D-sub 15-pin connector, and a five-line BNC hookup for high-resolution adapters. The monitor ships with a miniDB-15-to-miniDB-15 adapter cable (as well as a power cable), and a BNC-4 to DB-9 adapter cable is available for \$39.99.

One interesting choice NEC made with its MultiSync FG series was to use a polished glass screen with antistatic coating rather than duller antiglare etched or coated glass. This allows the MultiSync 5FG to achieve a high degree of image brightness, but means a fair amount of screen glare. If your working conditions contribute to annoying reflections, NEC offers two lens cover options: a "light" lens that reduces some of the glare while increasing contrast and a "dark" lens that all but eliminates glare while sacrificing some brightness. The lenses are \$119 each, but they allow users to tailor the MultiSync 5FG to personal preferences.

COLOR MATCHING

For desktop publishing professionals, the 56.1-pound MultiSync 5FG includes NEC's much touted AccuColor color-matching feature. The system is based on the RGB model and requires some button-pushing practice. The monitor's front digital controls allow you to adjust the strength of the red, green, and blue electron beams for the purpose of matching screen colors to printed color output. This feature is not a panacea for DTP color ills, however, since color is still



The \$1,699 NEC MultiSync 5FG exhibited one of the brightest displays in the group, courtesy of its polished glass screen. Even brightness and clean lines are visible at the outermost edges of the screen.

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PERFORMANCE TESTS

Though you might expect performance to degrade at higher resolutions, most of the monitors reviewed here maintained fairly consistent performance levels across 800-by-600 and 1,024-by-768 resolutions.

WHAT THE NUMBERS MEAN

When testing these monitors at 800-by-600 and 1,024-by-768 resolutions, we expected to see a greater across-the-board performance degradation at the higher resolution, chiefly due to the increased strain on the display's electron gun. With the exception of the Swim Ratio test results, however, we found that most of the monitors' performance did not vary greatly between resolutions.

800-by-600 RESULTS

With the exception of the American Mitac M1758, CTX-1760, Relisys RE1776, Seiko CM1760LR, Sony CPD-1604S, and ViewSonic 7, all of the reviewed monitors offered adjustable pincushioning. Except in those instances where a monitor with adjustable pincushioning provided a default for that mode (as the NEC MultiSync 5FG does), we individually adjusted the pincushioning parameters for each system. Readjusting the pincushioning could result in very different scores from the ones reported here (for both the 800-by-600 and 1,024-by-768 tests).

Although every monitor exhibits some degree of pincushioning, almost every monitor's 800-by-600 Vertical and Horizontal Pincushioning scores fell within the acceptable range, less than twice the respective line width. (Anything over that will produce a more noticeable bowing of the screen.) The MAG MX17F and the HP Ultra VGA 17-Inch Display had remarkably low Vertical Pincushioning scores of 4.69 mils and 6.04 mils, respectively, on our 800-by-600 test. Note the very good performance of the nonadjustable Sony monitor on the Vertical Pincushioning test and the nonadjustable ViewSonic monitor on the Horizontal Pincushioning test. This points up the difficulty of achieving an

optimal pincushioning adjustment using only the human eye.

Seven of the monitors provided acceptable levels of Vertical-Line Convergence, returning test results lower than 8 mils (the point where convergence can be seen with the naked eye). At 1.4 mils, the AcerView 76 exhibited nearly no convergence at all. By contrast, at 18.4 mils, the CTX-1760 had the worst convergence.

The Line Width Variance reflects the monitor's pixel squareness. On monitors with in-line guns (stripe-mask or Trinitron), pixels are generally taller than they are wide. Leading the pack here were the dot-mask monitors from American Mitac and CTX International. The American Mitac M1758 and the CTX-1760 both offered nearly perfectly square pixels, deviating only 1 percent from the optimal 1:1 ratio. The AcerView 76 took third place, closely followed by the Epson Professional Series and the Tatum CM-17MBD.

Image stability can be determined by the Swim Ratio test results. In 800-by-600 mode, nearly all of the monitors tested were fairly stable, with the Toshiba P17CM01 leading the pack with a swim ratio of 0.18. The only truly poor performers were the American Mitac M1758, at 0.42, and the Idek/Iiyama MF-5317, with an astonishing swim ratio of 1.84.

1,024-by-768 RESULTS

With a few exceptions, the increase in resolution produced only minor changes in most of the monitors' Vertical and Horizontal Pincushioning scores. The NEC MultiSync 5FG did the best overall on the 800-by-600 and 1,024-by-768 pincushioning tests, with scores of 13.00 mils (vertical) and 11.30 mils (horizontal) at the lower resolution, and 7.00 mils (vertical) and 7.57 mils (horizontal) at the higher resolution.

Vertical-line convergence at 1,024-by-768 resolution was nearly as good as the convergence scores at 800-by-600 resolution. Nearly half the monitors exhibited scores of 8 mils or less (the visible threshold), with the Mitsubishi Diamond Pro 17 and the AcerView 76 possessing extremely low levels. The degree of convergence for the NEC MultiSync 5FG changed dramatically for the worse between

resolutions: It went from 2.96 mils at 800-by-600 to 11.40 mils at 1,024-by-768. As in 800-by-600 mode, the CTX-1760 placed last in this category: It showed an increase of nearly 8 mils over its 800-by-600-resolution score of 18.40.

On the Line Width Variance test, the AcerView 76 placed at the top of the list in high-resolution mode. It was followed by the Epson Professional Series and the American Mitac M1758, with no more than a 5 percent difference from the optimal 1:1 ratio; these three maintained their nearly square pixel characteristics in both resolutions. But the CTX-1760 and the Tatum CM-17MBD suffered with the increase in resolution, showing 36 percent and 22 percent differences from the 1:1 ratio, respectively, at the higher resolution.

The Swim Ratio scores at this resolution, on the average, were worse than the Swim Ratio scores at 800-by-600. The Toshiba P17CM01 did best at both resolutions, but unlike what happened with the 800-by-600 scores, it barely placed ahead of the ViewSonic 7, the MAG MX17F, and the Seiko CM1760LR in 1,024-by-768 testing. The Relisys RE1776 trailed the pack, with a swim ratio of 0.53.

HOW WE TESTED

We tested the monitors for this review with the Microvision Superspot 100. This device calculates spatial relationships and uses a tiny array of photodiodes to measure the light emitted from the screen. Using ATI Technologies' VESA-compliant VGA-Wonder XL Series video card, we drew 1-pixel-wide lines at the borders of the screen in both 800-by-600 (Super VGA) and 1,024-by-768 resolutions. The Superspot 100 used those lines to measure screen anomalies and image problems such as pincushioning, convergence, and swim. For both tests, the VGA-Wonder XL Series was configured for the VESA standard vertical refresh rates of 72 Hz at 800-by-600 and 70 Hz at 1,024-by-768 resolution.

Please remember that monitor performance varies among units from the same manufacturer and even within the same model. Our tests are an indication of relative performance; they do not characterize the absolute attributes of any one display.

COVER STORY 17-INCH MONITORS

The **Vertical Line Width** test measures the width of a 1-pixel-wide vertical line 1 inch above the screen's bottom right-hand corner. Three separate lines (red, green, and blue) are measured, and the average is given in mils (one mil = 0.001 inch).

The **Vertical Pincushioning** test measures the curvature of a vertical line near the edge of the display. Pincushioning is given in terms of the maximum deviation from a straight vertical line. A smaller number indicates a straighter line.

The **Horizontal Line Width** test measures the width of a 1-pixel-wide horizontal line located 1 inch below the screen's top left-

hand corner. Three separate lines (red, green, and blue) are measured, and the average is given in mils.

The **Horizontal Pincushioning** test measures the curvature of a horizontal line near the edge of the display. Pincushioning is given in terms of the maximum deviation from a straight horizontal line. A smaller number indicates a straighter line.

The **Vertical-Line Convergence** test score represents the worst-case convergence of the three electron guns. We measured the distances between the centers of excited red, green, and blue dots within a vertical line at the screen's bottom right-hand corner, and

we report the largest of the three distances. A smaller number indicates that the monitor displays less color "bleeding."

Line Width Variance is a computed figure that indicates the deviation from an optimal 1:1 ratio between horizontal and vertical line widths. For Super VGA and 1,024-by-768, which have nominally square pixels, a lower value indicates better pixel sizing.

Swim Ratio is a computed figure that reports swim (the distance a line moves over a 30-second period) as a proportion of average vertical line width. A lower number indicates better image stability.

800-BY-600 RESOLUTION

	Vertical Line Width (mils)	Vertical Pincushioning (mils)	Horizontal Line Width (mils)	Horizontal Pincushioning (mils)	Vertical-Line Convergence (mils)	Line Width Variance (deviation from 1:1 ratio)	Swim Ratio (proportion of line width)
Toshiba P17CM01	22.50	30.40	14.87	27.00	15.30	0.34	0.18
ViewSonic 7	20.47	23.50	10.80	14.30	3.35	0.47	0.26
AcerView 76	20.37	23.50	18.80	27.60	1.40	0.08	0.28
Seiko CM1760LR	24.33	14.10	15.37	41.80	9.46	0.37	0.28
Tatung CM-17MBD	22.70	16.00	20.63	27.00	12.60	0.09	0.28
Epson Professional Series	23.70	43.50	21.47	36.60	9.43	0.09	0.30
Mitsubishi Diamond Pro 17	22.60	28.80	15.13	36.00	2.38	0.33	0.30
CTX-1760	18.60	14.90	18.80	27.50	18.40	0.01	0.31
MAG MX17F	17.30	4.69	11.77	24.10	8.25	0.32	0.31
Nanao Flexscan F550i	17.17	37.50	9.73	15.20	5.93	0.43	0.34
Relisys RE1776 17-Inch High Resolution Multiscan Color Monitor	26.50	53.30	19.93	16.60	10.20	0.25	0.35
HP Ultra VGA 17-Inch Display	20.20	6.04	13.47	24.90	8.97	0.33	0.36
NEC MultiSync 5FG	15.53	13.00	11.42	11.30	2.96	0.26	0.36
Sony CPD-1604S 17" Multiscan Trinitron Color Computer Monitor	19.40	10.00	16.43	22.30	3.56	0.15	0.36
American Mitac M1758	23.70	24.40	23.43	25.80	15.00	0.01	0.42
Idek/Iiyama MF-5317	16.60	11.80	11.10	22.60	7.44	0.33	1.84

1,024-BY-768 RESOLUTION

	Vertical Line Width (mils)	Vertical Pincushioning (mils)	Horizontal Line Width (mils)	Horizontal Pincushioning (mils)	Vertical-Line Convergence (mils)	Line Width Variance (deviation from 1:1 ratio)	Swim Ratio (proportion of line width)
Toshiba P17CM01	21.13	27.50	14.63	24.50	19.30	0.31	0.23
ViewSonic 7	19.67	13.60	12.40	30.50	5.17	0.37	0.25
MAG MX17F	16.10	6.70	12.83	31.00	8.08	0.20	0.26
Seiko CM1760LR	22.70	13.70	15.30	32.80	7.30	0.33	0.26
Epson Professional Series	23.27	45.60	22.33	19.30	12.50	0.04	0.27
CTX-1760	21.53	14.90	18.07	32.60	25.50	0.36	0.28
Nanao Flexscan F550i	17.53	37.00	11.80	6.66	3.93	0.33	0.31
NEC MultiSync 5FG	16.10	7.00	9.78	7.57	11.40	0.39	0.32
Mitsubishi Diamond Pro 17	17.90	30.10	13.00	24.40	1.16	0.27	0.34
AcerView 76	19.27	24.50	19.10	21.20	2.39	0.01	0.35
American Mitac M1758	22.20	7.05	21.20	21.60	8.79	0.05	0.36
Sony CPD-1604S 17" Multiscan Trinitron Color Computer Monitor	20.23	8.50	15.67	18.40	5.05	0.23	0.39
Idek/Iiyama MF-5317	15.40	13.20	9.79	24.80	6.42	0.36	0.42
Tatung CM-17MBD	13.00	13.00	15.90	18.30	17.10	0.22	0.45
HP Ultra VGA 17-Inch Display	18.20	8.68	11.27	16.20	9.21	0.38	0.46
Relisys RE1776 17-Inch High Resolution Multiscan Color Monitor	25.43	29.00	21.03	15.90	15.80	0.17	0.53

Product order is determined by performance on the Swim Ratio test.

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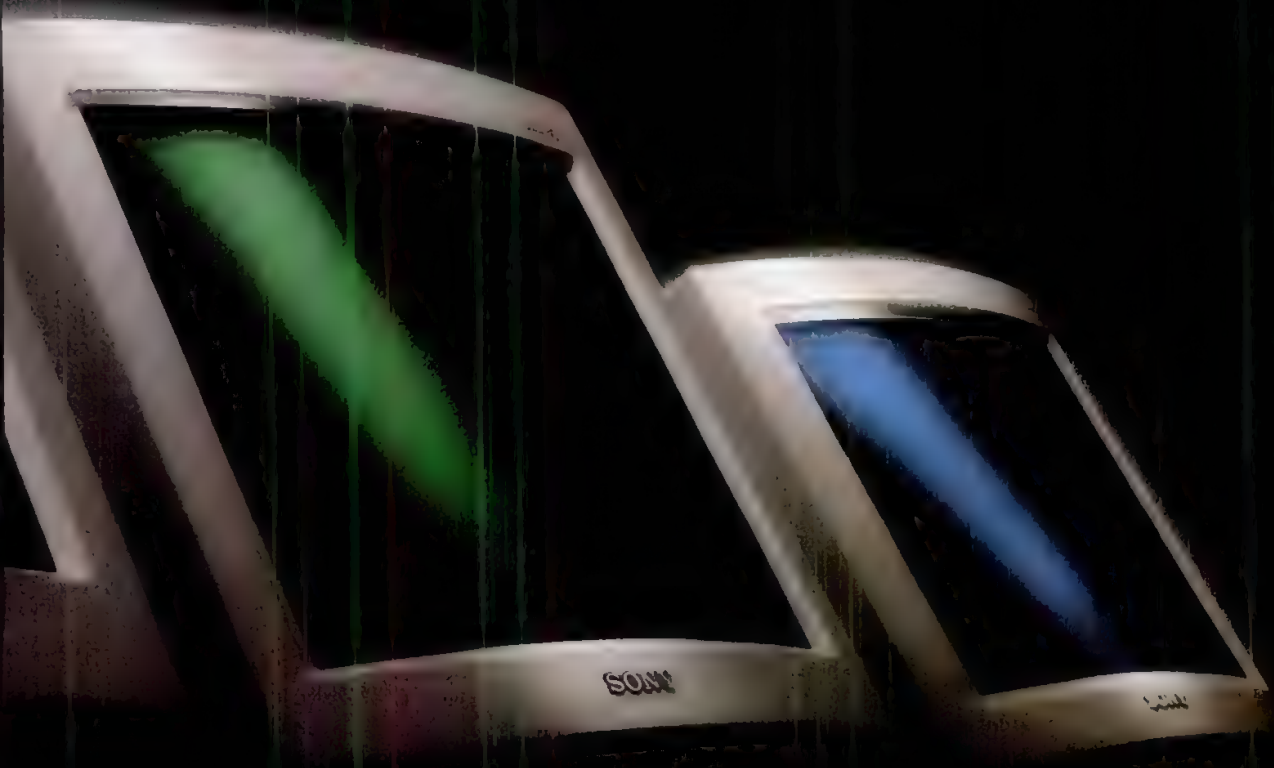
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SONY



FACT FILE

NEC MultiSync 5FG

NEC Technologies Inc., 1255 Michael Dr., Wood Dale, IL 60191; 800-388-8888, 708-860-9500.

List Price: \$1,699. Optional antiglare lens, \$119.

Requires: VGA or better graphics adapter.

Visible Diagonal Screen Size: 15.3 inches.

In Short: To keep abreast of prevailing monitor trends, users—and competitors—watch NEC's screens. The NEC MultiSync 5FG continues to break new ground in terms of design, features, and performance. Desktop publishing professionals should pay particular attention to this monitor's color-matching feature.

CIRCLE 518 ON READER SERVICE CARD

affected by changing lighting conditions, the applications used (different programs, for example, use different color lookup tables), individual color perception, and much more (see the sidebar "Matching Color at Gunpoint").

The MultiSync 5FG matches its wide array of features with good performance. In both Super VGA and 1,024-by-768 resolutions, the MultiSync 5FG elicited some of the best results in this group. The MultiSync 5FG did the best overall on the 800-by-600 and 1,024-by-768 Pincushioning tests: It scored 11.30 mils horizontal and 13.00 mils vertical at the lower resolution and 7.57 mils horizontal and 7.00 mils vertical at the higher resolution. It also provided excellent Vertical-Line Convergence scores in 800-by-600, though not in 1,024-by-768.

Under the Microsoft Windows tests, the MultiSync 5FG maintained its composure, delivering excellent transient response and one of the brightest images in this group—due in part to its polished screen. Even the 1,024-by-768 resolution failed to shake the monitor's resolve; the unit delivered even brightness and clean lines at the outer most edges of the screen.

NEC's line of MultiSync FG monitors is covered by a two-year parts, one-year labor warranty. Technical support is provided via a toll-free phone number (weekdays from 8:30 to 6:00 C.S.T.), a fax service, and a user BBS.

Street prices for the MultiSync 5FG are a bit high, (hovering around \$1,350), though still very competitive for the 17-inch crowd. If you do not need quite that much screen area, though, the 15-inch NEC MultiSync 4FG, which includes AccuColor and a maximum noninterlaced

COVER STORY 17-INCH MONITORS

resolution of 1,024 by 768, is a bargain, with a current street price around \$740. But if you want a 17-inch display with admirable image qualities, the NEC MultiSync 5FG makes a good choice.

RELISYS

Relisys RE1776 17-Inch High Resolution Multiscan Color Monitor

—by John R. Quain—

The Relisys RE1776 17-Inch High Resolution Multiscan Color Monitor demonstrates that there is more to monitors than size and specifications. Though the \$1,495 17-inch Relisys RE1776 has a broad 16-inch-diagonal viewing area, a video bandwidth of 125 MHz, and a tight dot pitch of 0.26 mm, its performance does not match that of monitors with less stellar qualifications.

Based on a flat-square CRT using an Invar shadow mask, the 55-pound Relisys RE1776 comes standard with a tilt/swivel base, a power cable, a BNC-5-to-miniDB-15 adapter cable, an etched antiglare screen with antistatic coating, and a single BNC-5 input. The five-wire BNC input enables the monitor to handle the high video bandwidth, and its vertical scanning range of 40 Hz to 120 Hz and horizontal scanning range of 30 kHz to 76 kHz allow it to accept a wide variety of signals.

Unlike some of the other monitors in this roundup, the Relisys RE1776 is not a



The \$1,495 Relisys RE1776 17-Inch High Resolution Multiscan Color Monitor had problems with roping and with maintaining a consistent brightness out to the edges of its display.

low-emissions VLF or ELF design. It also features less precise analog (versus digital) controls for image adjustments, though all are conveniently located on the front of the monitor. Dials for brightness and contrast are situated next to the power button. A flip-down panel hides tuning knobs for vertical and horizontal position and size, along with buttons for sync on green, VGA mode, and degaussing.

The variable-frequency multiscan monitor handles noninterlaced signals from VGA (at an ergonomic 72-Hz vertical refresh rate) to 1,280-by-1,024 (at a 60-Hz vertical refresh rate). Though it will automatically sync to those frequencies, the unit does not offer an internal microprocessor to store user-specified settings. Instead, the monitor relies on preset sizings for 1,024-by-768 (noninterlaced), VGA, 720-by-400, 640-by-350, and IBM 8514/A. If you frequently switch between DOS and high-resolution graphics applications, you will have to make adjustments manually to keep things aligned.

PERFORMANCE NOT UP TO PAR

The Relisys RE1776's performance in PC Magazine Labs' tests was consistent in both 800-by-600 and 1,024-by-768 modes—and disappointing. As measured by the Superspot, average Horizontal Line Widths were among the five widest measured, and average Vertical Line Widths were the widest in both resolutions. Vertical-Line Convergence results also placed in the bottom five in both modes. Vertical Pincushioning in 800-by-600 and Swim Ratio results in 1,024-by-768 did not improve the Relisys RE1776's picture, either.

A hands-on evaluation running Microsoft Windows 3.0 in the same resolutions confirmed these results. Vertical borders exhibited significant roping, creating a ripple effect on objects adjacent to the screen edges. However, transient response was up to par as measured through our bandwidth test, with clearly defined edges between closely packed letters. There was some uneven brightness, though, with the center of the display often appearing slightly brighter than the edges.

It is difficult to judge whether this performance is confined to our evaluation unit or is common to the Relisys RE1776 line. Different monitors with the same model number can vary in performance. But the generally below-average perfor-

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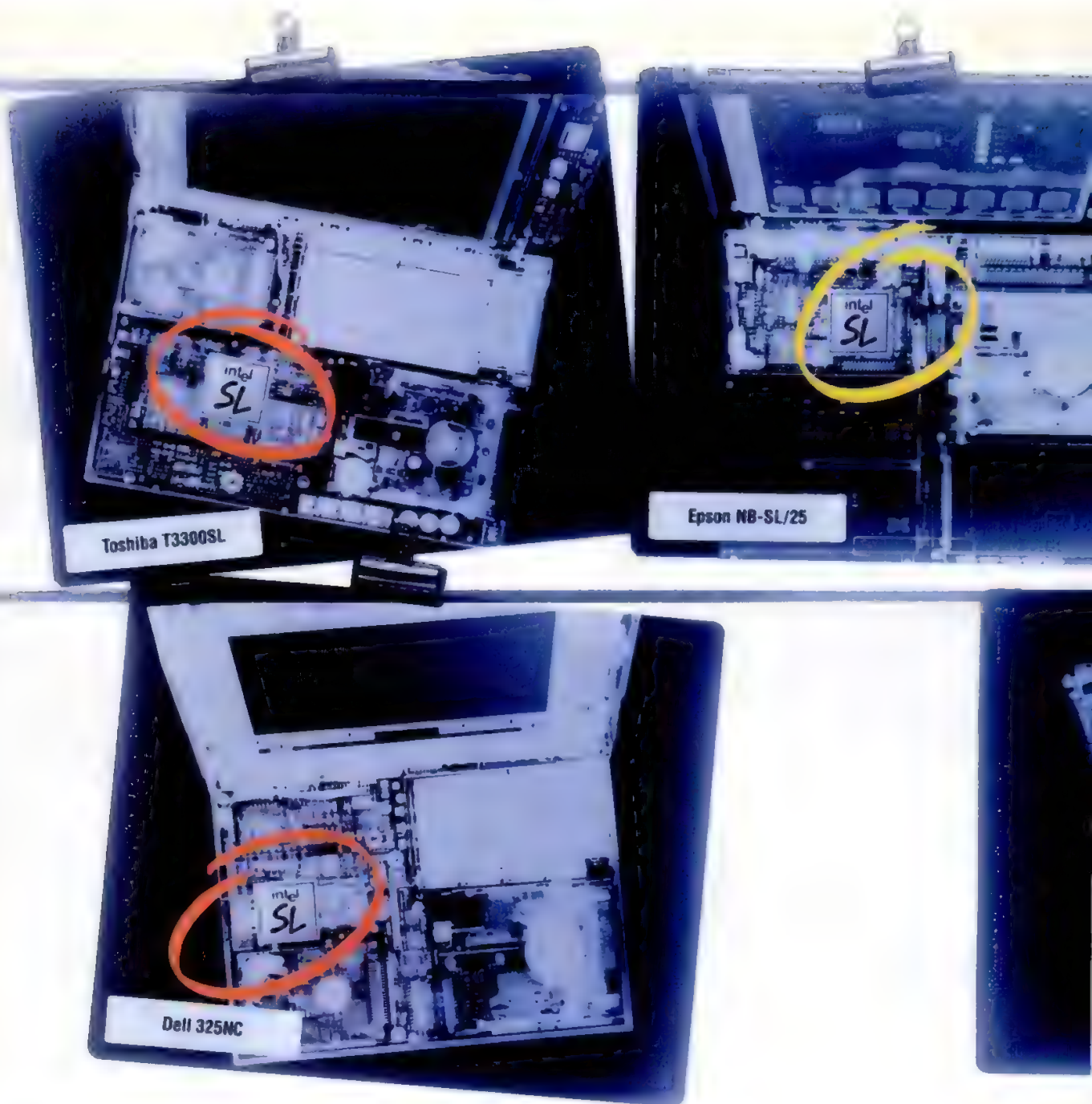
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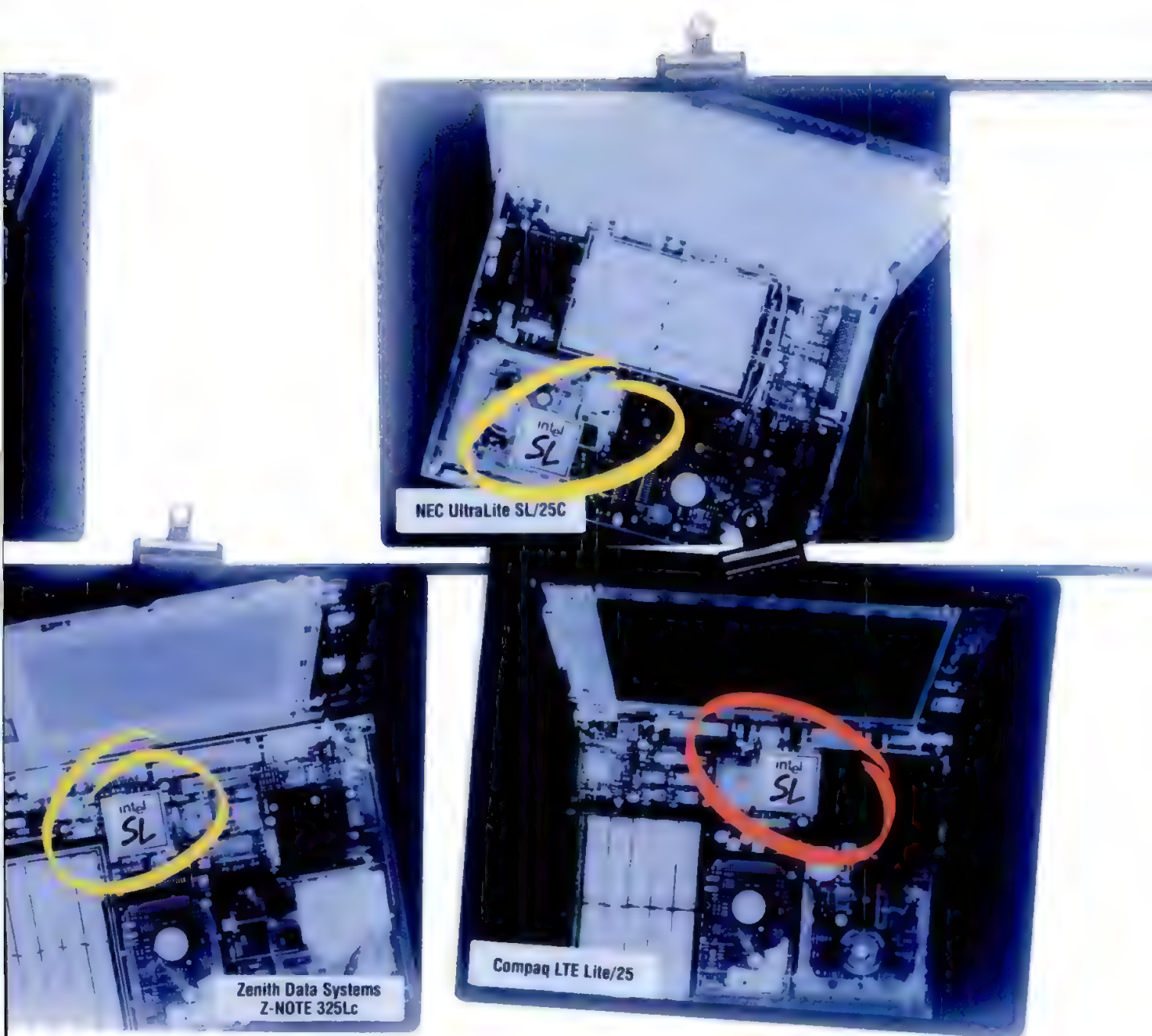


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FACT FILE

Relisys RE1776 17-inch High Resolution Multiscan Color Monitor
Relisys, 320 S. Milpitas Blvd., Milpitas, CA 95035; 408-945-9000.
List Price: \$1,495.

Requires: VGA or better graphics adapter.
Visible Diagonal Screen Size: 16.0 inches.
In Short: A monitor with promising qualities, the Relisys RE1776 17-inch High Resolution Multiscan Color Monitor does not live up to expectations. Below-average performance and a lack of basic features prevent this model from seriously challenging the 17-inch leaders.

CIRCLE 518 ON READER SERVICE CARD

mance of the Relisys RE1776 indicates that it is not up to the high standards set by the top models in this group.

Relisys offers a standard warranty that covers parts and labor for one year, with an additional year of coverage on the CRT. Free technical assistance is provided through a regular toll number weekdays from 8:00 to 5:00 P.S.T. A year ago, the Relisys RE1776's combination of support, features, and average performance would have stood it in good stead. But against today's contenders, it comes up short.

SEIKO INSTRUMENTS USA INC.

Seiko CM1760LR

by Ed Perratore

Seiko Instruments USA's 17-inch Seiko CM1760LR boasts a Sony Trinitron tube, an admirable 0.25-mm aperture grille pitch (the equivalent of dot pitch for



The Seiko CM1760LR uses a Sony Trinitron tube. Its 0.25-mm aperture grille pitch enhances picture quality and distinguishes the \$1,599 model.

Trinitron screens), ELF and VLF radiation control, and a 1,280-by-1,024 resolution that makes it even more attractive for high-end graphics in a medium-size package. While the 51-pound monitor gives up a few features in order to keep its \$1,599 price, it remains a worthwhile contender.

Standard with your purchase is a tilt/swivel stand, a removable power cord and an adapter cable wired for DB-15 at the monitor end, and a miniDB-15 connector for your graphics card. To get the greatest bandwidth, you may instead wish for a BNC hookup. Toward this end, Seiko provides a 4-wire BNC connection as well. All that's missing is a switch to toggle between the two connection options.

The Seiko display is coated with a silica compound intended to reduce glare and increase contrast and sharpness. The monitor's 16.5-inch-diagonal viewing area was one of the most generous we saw.

On PC Magazine Labs' Superspot tests, the product had below-average Line Width Variance numbers. That is not entirely unexpected in a system using a Trinitron tube, and in fact, no deviation from pixel squareness was actually distinguishable to the naked eye. It proved to have better Vertical-Line Convergence scores in 1,024-by-768 mode than in 800-by-600, though on our more subjective Microsoft Windows tests, convergence seemed to be a small problem at the higher resolution. Slight barrel distortion was also evident in the 1,024-by-768 mode, but otherwise, image quality was good.

A COUPLE OF SACRIFICES

Seiko made sacrifices in its attempt to keep the Seiko CM1760LR competitively priced. For instance, the monitor will maintain image size through all standard modes from VGA through noninterlaced 1,280-by-1,024. But when you need to adjust the image, the product provides only the usual dials for brightness, contrast, and horizontal and vertical size and positioning. These are smartly arranged beneath the screen for easy access, but more options—such as pincushioning

control—would be welcome.

The other sacrifice is the lack of any capability to store image size and related display information for enhanced detection of the incoming video signal. Like the Sony model, the Seiko may have difficulty setting the correct size and other characteristics if your video card is sending an oddball signal still within the model's accepted frequencies. This means constant re-adjusting every time the monitor is powered-on.

On the plus side, the monitor is a variable-frequency multiscan offering, with a 100-MHz

video bandwidth. It offers a vertical scanning frequency of 50 Hz to 90 Hz, and a horizontal scanning frequency of 31 kHz to 64 kHz.

Free, unlimited support is available for the Seiko CM1760LR through a toll number manned weekdays from 8:00 to 5:00 P.S.T. The warranty is 12 months on parts and labor with return shipping paid by Seiko. FCC Class B certification is expected by the time you read this; VLF and ELF radiation control are already standard.

When you shop for a monitor displaying 1,280-by-1,024 resolution and higher, you see how the challenges of maintaining image quality are more difficult at the higher resolutions. The Seiko CM1760LR, despite its flaws, is a monitor that deserves consideration for any graphics work that can settle for a 17-inch monitor.

The Seiko's 16.5-inch-diagonal viewing area was one of the most generous we saw.



FACT FILE

Seiko CM1760LR

Seiko Instruments USA Inc., Color Graphics Group, 1130 Ringwood Ct., San Jose, CA 95131; 800-888-0817, 408-922-5900.
List Price: \$1,599.

Requires: VGA or better graphics adapter.
Visible Diagonal Screen Size: 16.5 inches.
In Short: The Seiko CM1760LR has much to recommend it, including noninterlaced 1,280-by-1,024 graphics. It has some slight problems with barrel distortion and lacks the ability to store image-size settings, but a sharp 0.25-mm aperture grille pitch and connectors for high-bandwidth BNC signaling add to the product's attraction.

CIRCLE 520 ON READER SERVICE CARD

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THINK 486
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COMPUTERS
ARE BRAND
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COST ALOT.**

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- 5.25" and 3.5" Floppies

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\$2735

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- Intel 80386DX-25 System
- 1MB RAM, 50MB 17ms IDE Drive
- 12" Mono Monitor
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September 11, 1990

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May 26, 1992

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Government Computer News
Product Preference Survey
January 20, 1992



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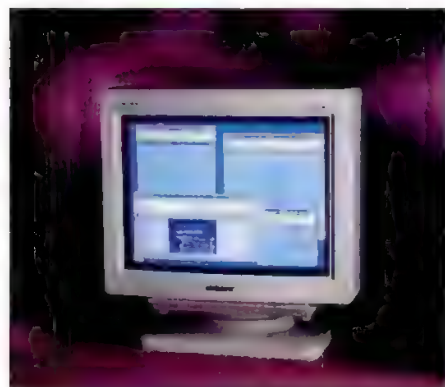
**SONY COMPUTER
PERIPHERAL PRODUCTS CO.**

Sony CPD-1604S 17" Multiscan Trinitron Color Computer Monitor

by Ed Perratore

The Sony CPD-1604S 17" Multiscan Trinitron Color Computer Monitor sports a high price tag of \$1,789.95, which includes a tilt/swivel base, generous 84-inch power cord, and built-in adapter cable (with a DB-15 connector to the video card). While the Sony CPD-1604S demonstrated some performance superiority over several other models, in other respects, the product's features too often fell short.

The Sony CPD-1604S produces bright, sharp images and rich colors on the 16.4-inch-diagonal viewing area. The product's silica coating helps reduce glare. Also in the monitor's favor is a crisp 0.25-mm aperture grille pitch and good performance on PC Magazine Labs' Vertical-Line Convergence and Line Width Variance tests. The latter is particularly notable considering that on Trinitron screens, pixels are generally longer than they are wide. Unlike some other monitors, the Sony CPD-1604S's Horizontal and Vertical Pincushioning scores were fairly well under twice the respective line widths. On subjective testing in both display modes, however, our test model demonstrated a fair amount of inward bending, though only in the upper corners.



The \$1,789.95 Sony CPD-1604S 17" Multiscan Trinitron Color Computer Monitor offers a 0.25-mm grille pitch aperture. This monitor's one-gun, three-beam Trinitron design helps produce bright images and rich colors.

POWERSTORY 17-INCH MONITORS

FACT FILE

Sony CPD-1604S 17" Multiscan Trinitron Color Computer Monitor
Sony Computer Peripheral Products Co., 655 River Oaks Pkwy., San Jose, CA 95134; 800-352-7669
List Price: \$1,789.95.
Requires: VGA or better graphics adapter.
Visible Diagonal Screen Size: 16.4 inches.
In Short: The Sony CPD-1604S 17" Multiscan Trinitron Color Computer Monitor demonstrates the rich colors and fine contrast for which the Trinitron technology has made its name. But limited auto-sizing options, some noticeable inward bending at upper corners of images, and poorly accessible controls are among the strikes against this offering.

CIRCLE 521 ON READER SERVICE CARD

To its credit, the Sony CPD-1604S is a variable-frequency multiscan design. It offers a low 60-MHz bandwidth, however. The video scanning frequencies supported range from 50 Hz to 87 Hz, and horizontal scanning frequencies from 28 kHz to 57 kHz.

SOME DRAWBACKS

The Sony CPD-1604S supports standard modes from VGA through 1,024-by-768 noninterlaced, among others. A switch on the left-hand side allows the monitor to maintain a constant image size solely for 1,024-by-768 interlaced and vanilla VGA modes, a limitation compared with some competitors' versions of auto-sizing. No other settings are possible, either as factory defaults or user-defined.

What does this mean? Primarily, that users of multiple applications will be frequently craning their necks to get at the user controls, which are located on the left side panel. These little posts turn to adjust horizontal and vertical size and positioning, but there is no control for screen shape. Controls for brightness and contrast are included.

The product's documentation is clear and fairly comprehensive. But if you need help anyway, technical support is available weekdays from 8:00 to 5:00 E.S.T. or P.S.T., depending on which number you dial. While support for the 48-pound monitor is free and unlimited, you must call a toll number. If you need repair or replacement during the 12-month parts-and-labor warranty (the tube carries a two-year warranty for parts only), Sony maintains 26 authorized service centers around the country.

There remains much to respect in the Sony CPD-1604S, but the company cannot expect to coast on the excellent reputation of its Trinitron technology, even with the monitor being discounted about 33 percent on the street. Monitors in its price class—as well as below—are offering many more auto-sizing options, more accessible controls (that require less frequent adjustment), and a greater choice of display enhancement options such as pincushioning controls. With a closer eye on its competition, Sony could be a much more powerful contender.

TATUNG CO. OF AMERICA INC.

Tatung CM-17MBD

by Alfred Poor

The Tatung CM-17MBD uses a flat-square tube, sports a shadow mask using a variation on the Invar technology, and comes with a reasonable list price of \$1,599. But though it looks good on paper, its performance falls short of the competition.

Tatung dropped \$200 off the price of this 44-pound monitor at Spring Comdex, which is one indication of how the competition is heating up in this market segment. The variable-frequency multiscan monitor boasts a tilt/swivel base, a fine 0.26-mm dot pitch, digital controls (including one for horizontal pincushioning), BNC and DB connectors, a generous 90-inch power cable, and a DB-15-to-miniDB-15 adapter cable. A BNC-5-to-miniDB-15 cable is available, if you prefer, for \$15. The screen offers a 15.7-inch-diagonal



The \$1,599 Tatung CM-17MBD has a fine 0.26-mm dot pitch, but it also experienced some convergence problems and showed visible ghosting at the end of lines of text in bandwidth tests.

COVER STORY 17-INCH MONITORS

nal viewing area and is silica-coated to reduce glare.

The microprocessor-equipped monitor comes with nine factory preset image size settings for common signal types, and you can program up to eight additional user settings. Furthermore, you can make and store changes to all 17 possible settings; the monitor automatically records any changes four seconds after you finish making adjustments.

The monitor handled our VESA compliance tests with 70-Hz refresh rates at 1,024-by-768 resolution, and 72 Hz at 800-by-600. The monitor's specifications also indicate support for 1,280-by-1,024 resolution at 60 Hz.

PERFORMANCE MINUSES

On both our subjective testing and on PC Magazine Labs' tests using the Superspot, vertical-line convergence was not up to par, with noticeable misalignment not just in the corners but also at the center of the screen. There was some roping of vertical lines, especially at the 800-by-600 resolution. The monitor also exhibited a fairly high Swim Ratio score on our test in 1,024-by-768 mode. In spite of the monitor's 100-MHz bandwidth specification (using the BNC connector), when faced with a crowded text image, the unit showed visible ghosting at the end of the text lines, and the space between the letters was gray instead of a sharp delineation between the black letter and white background on the bandwidth tests.

The company offers toll-free technical support weekdays from 8:00 A.M. to

8:30 P.M. E.S.T.; Tatung also provides the standard one-year warranty.

*Testing showed that
the Toshiba P17CM01
projected only fair
picture quality.*

The new price makes the Tatung CM-17MBD a more competitive value, but unfortunately its image quality does not hold up against the competition. If you find a version of this unit with good convergence and geometry, then it can

be a fine choice. Based on our look at this evaluation unit, however, you can find a better screen among the competition.

TOSHIBA AMERICA
CONSUMER PRODUCTS INC.

Toshiba P17CM01

by Alfred Poor

With a suggested list price of \$1,900, the Toshiba P17CM01 is priced at the top of this group. The price includes a tilt/swivel base and a power cable, but unlike every other monitor reviewed here, the Toshiba P17CM01 does not include an adapter cable in the cost. In fact, Toshiba America Consumer Products did not offer any optional cables for sale at testing time, although it plans to have them on the market by the time you read this. More important, the high price does not guarantee optimal performance.

The microprocessor-equipped monitor, which weighs in at 57.2-pounds, has digital controls which are easy to reach and use. Unlike most monitors, which have separate buttons for each image feature, the Toshiba monitor simply has Increase and Decrease buttons; you use the Mode Select button to light the LED indicator above the feature you wish to adjust: vertical or horizontal size or position.

The digital controls come with nine factory presets, and you can define up to nine additional combinations of settings for other signals. There is a Mode switch on the front panel that allows you to select between the factory and user settings. Another switch allows you to select between two different signal sources—a miniDB-15 connector or the five BNC

connectors. The BNC connectors on this variable-frequency multiscan monitor offer a better bandwidth—100 MHz.

The one real complaint about the controls is the fact that the power switch is located around on the right side. Your fingers can find it easily enough if they know where to look, but a front position would be more sensible.

The monitor had no difficulty handling the high, VESA-approved vertical refresh rates of 70 Hz for 1,024-by-768 and 72 Hz for 800-by-600. It can go up to 1,280-by-1,024 at 60 Hz, as well.

JUDGING THE IMAGE

The monitor makes use of a shadow mask made of Invar. The silica-coated flat square screen offers a full 16-inch-diagonal viewing area.

Unfortunately, testing showed that the monitor projected only fair picture quality. Our Superspot tests for Vertical-Line Convergence placed the Toshiba P17CM01 at the back of the group in that respect, although the image was one of the most stable we measured: Its Swim Ratio scores were the best of the bunch at both resolutions. The naked eye could not distinguish any real difference between vertical and horizontal line widths. The image was not as crisp as some of the competitors, and there was visible roping on vertical lines. There was a faint graying of the left edges of text characters in the bandwidth test.

One of the most likely reasons for the average picture quality is the phosphor dot pitch. This monitor has a 0.31-mm dot pitch, which used to be excellent for a monitor this size. Today, though, many



The \$1,900 Toshiba P17CM01 offers an extremely stable image, but its image quality is not as crisp as some competitors, and there was visible roping on vertical lines.



FACT FILE

Tatung CM-17MBD

Tatung Co. of America Inc., 2850 El Presidio St., Long Beach, CA 90810; 800-829-2850, 213-979-7055.

List Price: \$1,599.

Requires: VGA or better graphics adapter.

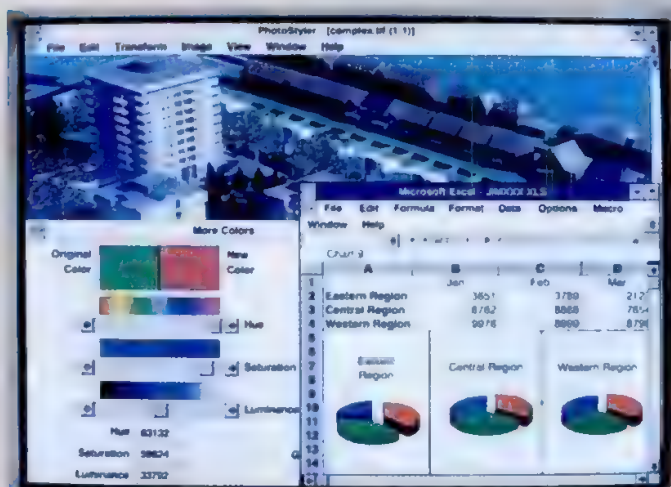
Visible Diagonal Screen Size: 15.7 inches.

In Short: The Tatung CM-17MBD has good specifications and a reasonable price, but the image quality is not up to par with the best in the field.

CIRCLE 882 ON READER SERVICE CARD

D IAMOND SCAN 16

Bigger Windows



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CIRCLE 280 ON READER SERVICE CARD



FACT FILE

Toshiba P17CM01

Toshiba America Consumer Products Inc.,
1010 Johnson Dr., Buffalo Grove, IL 60089-
6900; 800-253-5429 ext. 321, 708-541-9400
ext. 321.

List Price: \$1,900

Requires: VGA or better graphics adapter.

Visible Diagonal Screen Size: 16.0 inches.

In Short: The Toshiba P17CM01 has only average image quality, perhaps due to its larger 0.31-mm dot pitch. As a result, it is an acceptable choice, but there are better alternatives among the competition.

CIRCLE 523 ON READER SERVICE CARD

competing models have dot pitches of 0.28 mm or even 0.26 mm—about 10 to 15 percent finer. The difference definitely shows.

Toshiba offers free support weekdays from 9:00 to 5:00 C.S.T., and the product is covered by a one-year warranty. If you were buying a monitor based on specifications and company reputation, the Toshiba P17CM01 would seem like a reasonable choice. When subjected to a review among its peers, however, it is revealed to be adequate though not outstanding. A less expensive model, the Toshiba P17CU01, which can handle resolutions only up to 1,024 by 768, is available for \$1,700. And, for only \$200 more than the Toshiba P17CM01, the Toshiba P17CS01 is probably a better choice with its smaller 0.26-mm dot pitch. You certainly can do worse than the Toshiba P17CM01 we reviewed, but you also can do better.

VIEWSONIC

ViewSonic 7

by Alfred Poor

The ViewSonic 7 is a 17-inch monitor with above-average features and performance for below-average cost. With a list price of just \$1,399, it is one of the lowest-priced models in this group.

Best of all, the low price does not mean you lose any features. The cost includes a tilt/swivel base, power cable, and adapter cable. This is a fully digital design, with easy-to-use buttons for adjusting image size concealed behind a front panel hatch. Power and degaussing buttons are also on the front, as are brightness and contrast controls.

COVER STORY
17-INCH MONITORS

At 60.5 pounds, the monitor is just slightly heavier than most other designs. The only switch on the back allows you to switch between the two input connectors: a standard miniDB-15 connector and BNC-5 connector. The standard cable has miniDB-15 connectors on both ends; ViewSonic does offer a Mac II cable, but you will need to go elsewhere for BNC.

BEHIND THE SCREEN

The ViewSonic 7 uses the flat-square tube design that has become common for this monitor class. The flat-square screen is silica coated and measures a full 16-inch-diagonal viewing area. You cannot see some other features, however. The shadow mask is made of Invar, a new material designed for more accurate registration of the electron beams. And though ViewSonic does not make a big deal about it, the company claims that the monitor conforms to the newer and more rigid MPR II emissions standards, which call for lower VLF and ELF emissions.

The ViewSonic 7 monitor is also a variable-frequency multiscan design, which makes it more flexible in the signals it accepts than fixed-frequency multiscan units. The system is rated at a 110-MHz bandwidth, higher than much of the competition. It supports a vertical scanning frequency range of 50 Hz to 90 Hz, and a horizontal scanning range of 30 kHz to 64 kHz.

The monitor had no problem with faster refresh rates at higher resolutions: It managed 70 Hz at 1,024-by-768 and 72 Hz at 800-by-600 with apparent ease. The monitor even supports 1,280-by-1,024 resolution at a 60-Hz vertical refresh rate.



The \$1,399 ViewSonic 7 offers a 16-inch viewing area, a 0.28-mm dot pitch, and a generally sharp image.



FACT FILE

ViewSonic 7

ViewSonic, 12130 Mora Dr., Santa Fe
Springs, CA 90670; 800-888-8583, 310-946-
0711.

List Price: \$1,399.

Requires: VGA or better graphics adapter.

Visible Diagonal Screen Size: 16.0 inches.

In Short: The ViewSonic 7 has better-than-average features and a good quality image. Combine these with its low price, and this monitor may be the bargain buy of the bunch.

CIRCLE 524 ON READER SERVICE CARD

The unit we tested for this review had, for the most part, good Pincushioning scores on our tests with the Superspot. But its scores on the Horizontal Pincushioning test were more than twice the horizontal line width in 1,024-by-768 mode; a pincushioning control—which the monitor lacks—might have helped avoid this. The image stability, as measured by the Swim Ratio test, was among the best in both modes.

Subjective observations of the image reinforced most objective measurements. The ViewSonic 7 proved to be well-converged in most areas of the screen, though not the very best of the group. There were faint bands of gray extending beyond text lines, and the leading edges of letters went slightly gray in the bandwidth test, but the image was generally sharp. The ViewSonic 7 display was not the best of the bunch, but the 0.28-mm dot pitch helped create a clear, attractive, and above-average image.

ViewSonic offers technical support weekdays from 7:00 to 5:00 P.S.T. at an 800 number. The monitor is accompanied by a standard one-year parts-and-labor warranty.

The combination of competitive specifications, average performance or better, good image quality, and a low list price makes this monitor extremely attractive. ViewSonic monitors often appear in mail-order market channels, where the discounts can be significant. As a result, you may be able to find this one at an even better bargain price. Even if you don't, this unit is still well worth considering from a price/performance perspective. ■

Oliver Rist is a staff editor of PC Magazine. Alfred Poor is a contributing editor to PC Magazine. Kellyn Betts, Ed Perratore, and John R. Quain are frequent contributors to PC Magazine.

**PEOPLE IN THE
COMPUTER BUSINESS
HAVE BEEN TRYING
TO IMPROVE ON
COMPAQ FOR YEARS.**

GUESS WHO FI

It wasn't easy. Changing a company our size never is. But we listened to our customers, we studied our competitors, we took a long look in the corporate mirror. Then we did the only thing we know how to do. We rolled up our sleeves and went to work.



The result of all this distribution and, naturally, new products. Everything from inexpensive machines for basic computing needs, to advanced products

that stretch the envelope of technology at prices that our customers will find compelling and our competition should find, well, competitive.

What you won't see are stamped-out, second-rate products with the COMPAQ name stuck on at the end of somebody else's assembly line.

While that may be the way of the world, it's not the COMPAQ way.

We've always believed that the performance, compatibility, reliability, and actual affordability of a computer has more to do with innovation than with imitation.

So instead of asking

NALLY DID IT?

1200 of the world's finest computer engineers to forget all they knew about building great computers, we asked them to take all they knew and build great inexpensive computers.

Engineering to cost vs. engineering at any cost.

And as the best engineers do, they saw this not as a limitation, but as a challenge. A hurdle to overcome. A problem to ponder, twist, push, pull and ultimately solve.

They questioned manufacturing techniques, they challenged our suppliers, they turned every aspect of every process upside down, inside out

and sideways until they had managed to shake out every unnecessary cost or component.

No more over-think.

No technology simply for the sake of new technology.

And along the way to our new and improved destination, we learned a little something.

We learned that what makes a COMPAQ PC more than just another computer isn't simply the engineering. Or design. Or component quality. Or product testing.

It's not just the more tangible things such as compatibility or near-zero defect production

or the dozens of other examples you'll be discovering for yourself on the following nine pages of this advertisement.

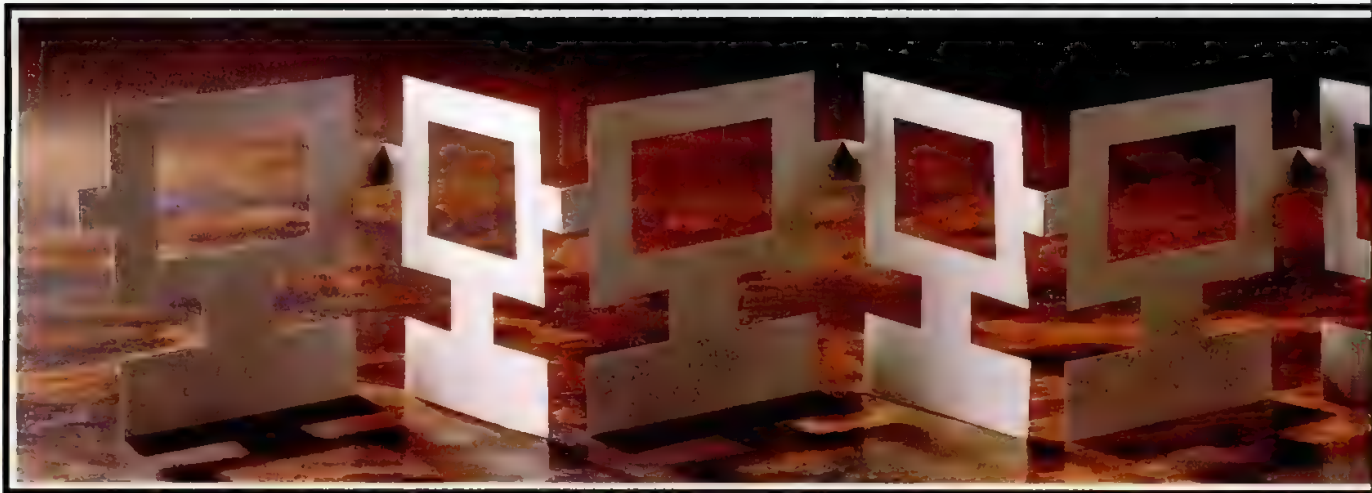
When all is said and done, what truly makes a COMPAQ PC far more than simply another computer is simply passion.

The passion to push technology, the passion to recognize the idea whose time has come, the passion to listen and learn and adapt to whatever our customers may want today while anticipating what they might need tomorrow.

In other words, the passion to do things right for the customer.



AT MOST COMPUTE STANDS FOR REPLIC



It's hard to believe, but at some PC companies the engineering department is nowhere to be found. Which stands to reason, since most other computers aren't engineered, they're copied. And, as with all copies, something is frequently lost in the translation.

What happens when companies lack the engineering depth to make new things happen? You guessed it...new things don't happen.

A fact few understand better than the 1200-plus engineers at Compaq.

The same engineers who developed the first portable computer with dual-mode monitor and an industry standard for compatibility. And the world's first desktop PC with concurrent bus.

The same engineers

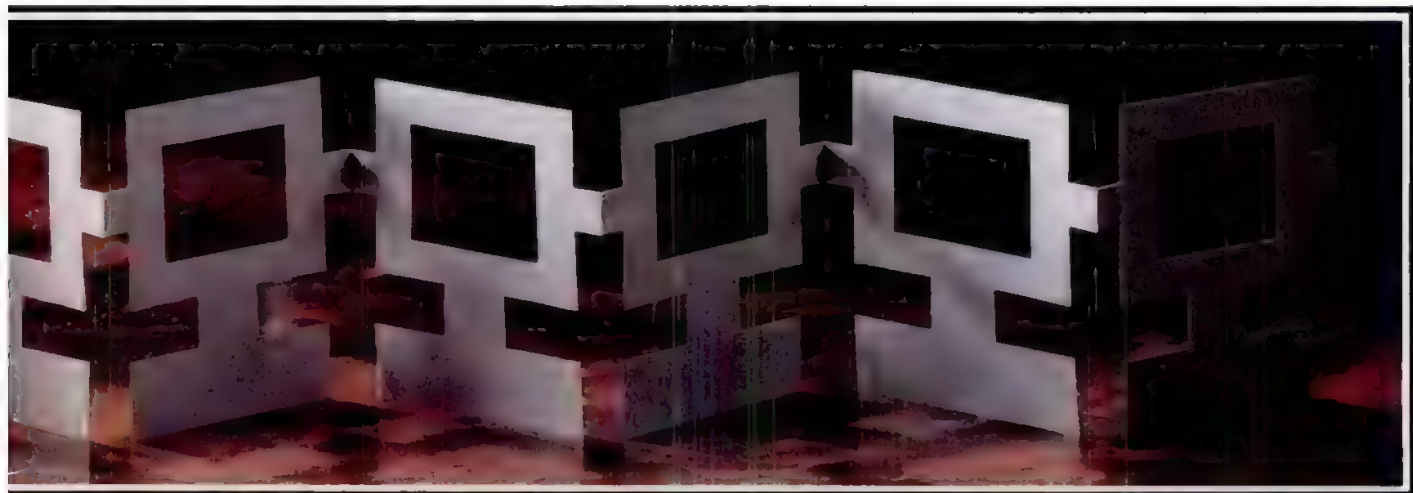
who designed and delivered the first 386 PC. And managed to break the 32-MB barrier in hard-drive technology.

Just for starters.

So what have we been up to lately?

Among other things,

R COMPANIES, R&D ATE AND DUPLICATE.



we just introduced the world's first lightweight 386SL/25 notebook PC with 120-MB hard drive and full desktop expansion capability.

Our engineers have developed sophisticated Windows accelerators, and conducted extensive research and testing to optimize Windows 3.1 performance on every COMPAQ computer. A test other companies will

no doubt leave you to perform on your own.

We've even been designing enhanced fault-tolerance features into our drive array adapters to make data reconstruction and retrieval easier, more automatic and far less disruptive to everyday operation.

As you read this, we're working on dozens of new computing ideas.

Some will arrive next

week. Some next year.

Some may change the way you look at computers forever. Others will simply make next year's COMPAQ products work a little better.

And finally, some will be just the kind of ideas our competitors have been looking for.

Ideas that wouldn't occur to them, however, until they looked inside a COMPAQ PC.



VARIETY MAY BE BUT TO A COMPUTER THE KISS

If you've ever attempted to put together a PC network, even one that's relatively simple, you know just what we mean. It can be time consuming. Nerve wracking. Sometimes even traumatic. And that's when everything goes according to plan.

Now obviously, variety is a fact of life when dealing with networks. There's probably not a single LAN that doesn't include a few PCs from one manufacturer, some more from another, and still more from a third. (Not to mention a vast assortment of peripherals, interface cards and operating systems.)

And, being a leading proponent of PC technology, we're certainly

not suggesting that you scrap all your hardware and start from scratch with strictly COMPAQ products.

We do recommend, however, that as your needs expand, you think a little differently about how you approach your next PC purchase.

Because, as you may have noticed, when you put bargain-basement variety components together and subject them

to the increasingly complex demands of today's computer network environments, compatibility problems arise.

It's like being at a bad cocktail party. Nobody talking to anybody and



everybody blaming the one who brought them all together.

And suddenly you find your well-thought-out, master-minded PC network has turned into a house of cards hit by a

THE SPICE OF LIFE, NETWORK, IT COULD BE OF DEATH.

rather stiff breeze.

On the other hand,
there's Compaq.

Unlike other comput-
er companies, we have an
entire group of engineers
who are dedicated exclu-
sively to testing network

environments. Working

with the world's major
software companies like

Novell, Banyan, SCO,
Microsoft, and others,
they test all COMPAQ
products in very active,
multi-user environments

network installations.

As a result, you can
be assured you're getting
products designed, engi-
neered and thoroughly
tested to operate within
the most complicated
network environments.



and communication hard-
ware and software.

In addition, we have
teams of engineers who
continually monitor the
everyday performance of
all COMPAQ computers
within various network

for hours, days and even
months on end.

To make integration
easier, we offer COMPAQ
TechNotes and ToolKits,
the most sought-after
guides in the computer
industry for multi-vendor

In short, products built
by a company dedicated
to solving potential PC
network integration prob-
lems in our offices.

That way you don't
end up having to solve
them in yours.



WHAT YOU DO WITH A COMPACT THE FACT THAT YOU MIGHT

Not too long ago, Denise Anderson of Morrison, Colorado, left her COMPAQ notebook PC in, of all places, her driveway. When next seen, the 6.9-pound computer had become a speed bump for 1.3 tons of automobile. When next used, it started up just fine.

Now, that may have been a bit surprising to Denise, but at Compaq, the engineering department didn't so much as raise an eyebrow.

After all, when a PC is designed to withstand

the slings and arrows of today's business world, a small thing like a minor traffic mishap is all in a day's work.

If you walked into the Compaq testing laboratories, what you'd see

is a computer owner's worst nightmare.

Computers subjected to the kinds of conditions you would only encounter during the height of summer in the Sahara. Or midnight in an Arctic winter.

Humidity, temperature, power-cycling and thermal-shock tests performed while the unit is up and running, not just



COMPUTER IS YOUR BUSINESS. T ACTUALLY DO IT IS OURS.

for a few hours, but for days and weeks to simulate years of normal use.

Keyboards that are pounded and punched millions of times, often with dust, dirt, ashes and other kinds of contaminants dumped into their workings.

Portable computers being opened and closed up to 20,000 times to ensure the integrity of the hinges. And dropped over and over again from terrifying heights, right onto their most vulnerable corners.

Just to make sure that your notebook PC can survive a couple of un-

attended hours stuck in the trunk of your car. Or the power surges of your electrical system. Or even an occasional heavy-handed operator.

But the important part of the story isn't simply that we put our products through one of the most rigorous testing programs in the entire computer industry.

The important part is they survive it.

That means reliability and serviceability are designed into the products, not added on as an afterthought.

It means thermal simulations to determine the best locations for components and cooling

devices. And electrostatic discharge protection integrated into the system from the start.

It means consistency of component quality from one production run to the next. And to the one after that.

It means, quite simply, that the ultimate goal of every Compaq engineer is to design a product that works, and keeps on working, no matter what.

A product, in other words, that won't break down under the pressures of today's complex business world.

Even when the pressures come to 1.3 tons.



FOR SERVICE AND SUPPORT ARE NOT STANDING

With our new service and support program, what you need is what you get. In fact, our technical support staff resolves 95% of all calls in under 15 minutes. And for questions that require greater expertise, we have engineers ready to get on the line.

All of which is just part of CompaqCare, a comprehensive new program designed to provide you with everything you may need when it comes to service and support. Quickly and easily.

Our free on-site* one-year, limited warranty, for instance, will cover practically anything that could happen to any of your COMPAQ hardware, anywhere it occurs in the U.S.A. or Canada. And, unlike most of our

competitors' programs, the new Compaq on-site warranty covers every product we build.

And no matter where you take COMPAQ portable or notebook PCs, they're also backed by a worldwide, one-year, carry-in warranty.

So wherever business takes you—from Tokyo to Turkey, Britain to Berlin—you can feel perfectly comfortable taking your COMPAQ portable along with you.



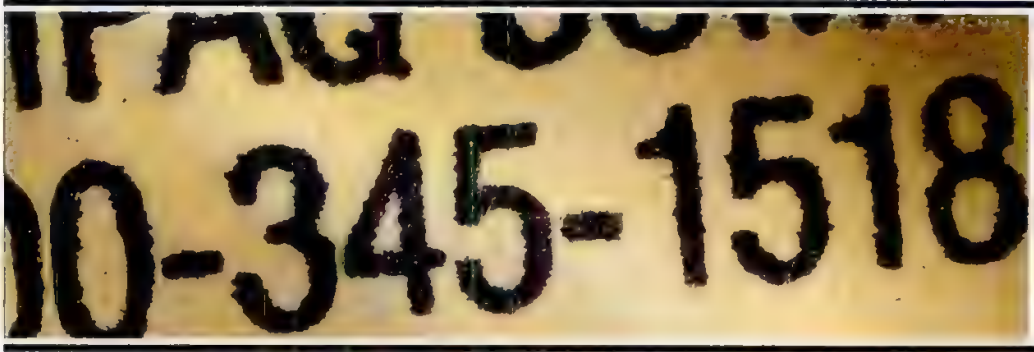
We also give users the flexibility to choose from over 2,000 Authorized COMPAQ Reseller service locations.

Or you can call on us directly for service.

For companies with technicians already on board, we offer a self-maintainer program that gives you access to all the support resources you need to perform whatever service you may find necessary.

And, of course, while

RT, JUST CALL. OPERATORS BY. ENGINEERS ARE.



increasing the scope of our warranty programs has certainly been our priority, we've also been working on many other important aspects of customer support.

Whenever you have questions, for example, the Compaq SMART System provides all our support personnel with a sophisticated information bank comprised of thousands of hours of troubleshooting and engineering expertise.

Which means the person who answers your call is certain to supply you with consistent, smart answers to all of your questions. And take care of even your most pressing problem. We even have on-line access with most of the major software companies to help you quickly take care of those software-related difficulties that you may encounter.

You'll also gain 24-hour electronic support

through three different services: CompuServe, PAQFax, and QuickFind, our CD-ROM technical reference library.

If, after all of the above, you're still not quite convinced that our new service and support program is one of the most comprehensive in the industry, call us on it.

1-800-345-1518.

On the other end of the phone, you'll find a whole bunch of people looking for trouble.



A THOUGHT FOR THOSE WHO APPRECIATE THE VALUE OF A DOLLAR AS WELL AS THE VALUE OF A COMPAQ.

"Now that we've made clear all the things that Compaq stands for, let us make it clear what we won't stand for anymore. High prices. We have a new mission. A new goal.

To provide you with Compaq quality, Compaq research and development, Compaq reliability and testing and service and support at the most competitive prices possible.

In other words, products that are exactly what you need, easy to find, and priced right.

That's what Compaq is all about today.

For the details on all of

the above, yes even the prices, give us a call at 1-800-345-1518, Ext. 205, in the U.S., 1-800-263-5868, Ext. 205, in Canada.

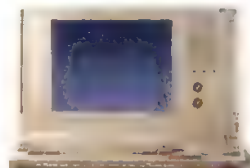
We think you'll like what we have to say."

—Eckhard Pfeiffer

President, CEO

Compaq Computer

Corporation



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CIRCLE 137 ON READER SERVICE CARD

Super Servers

Power, Reliability, Security— At What Price?

by David Greenfield

IN THIS REVIEW

AcerFrame 3000 MP33 ■ ALR PowerPro SMP 512 486/50 ■ Compaq Systempro 486-2040 ■ Digital Equipment Corp. applicationDEC 433MP ■ NetFrame NF400 Network Mainframe ■ Tricord PowerFrame 40/33C

The new breed of file servers comes with multiprocessors and disk arrays, providing scalability and fault tolerance for large networks. PC Magazine put six of these multiprocessing monsters at the helm of a 96-node network to help answer the question, Do you need a super server?

Networking used to be so simple: Just buy a PC with a fast processor and a superior hard disk and call it a file server. Not anymore. When you're trying to connect 100 or more users in a workgroup, a fast PC just isn't enough. Besides speed, you need security, fault tolerance, and superior server management.

Enter the multiprocessing super servers. With as many as half a dozen processors, high-speed buses, and gigabytes of disk space, these machines are designed to offer enough power to drive the largest corporate workgroups.

Are super servers loaded with MIPS? Sure. But the real test of one of these systems is not merely how fast it can calculate a spreadsheet or sort a database. The critical barometer is scalability—the server's ability to maintain the same level of performance as the number of concurrent users increases.

Finding that magic number requires extensive testing and a detailed analysis of the server's architecture. With that aim, we selected six of the hottest multiprocessing servers and sent them to our sister facility, ZD Labs, which put them at the helm of a 96-workstation test network.

We looked at five symmetrical multi-

processing servers and one asymmetrical multiprocessing server, and compared their I/O performance to that of two EISA-based Compaq Deskpro/M PCs—a 33-MHz 486 and a 25-MHz 386. The symmetrical servers—the AcerFrame 3000 MP33, ALR PowerPro SMP 512 486/50, Compaq Systempro 486-2040, applicationDEC 433MP (from Digital Equipment Corp.), and Tricord PowerFrame 40/33C—use two or more Intel 486 processors to run applications. The asymmetrical server, the NetFrame NF400 Network Mainframe, contains a single 486 CPU, but it also dedicates specialized processors to individual tasks.

The super servers' powerful architectures make them ideal for two uses: file or database services. Though both types of servers require top-notch disk I/O speeds, database servers also demand pure CPU muscle. For this reason, we measured both I/O and processor scalability.

ZD Labs tested the I/O scalability of five of these servers. (Digital does not recommend its product for *NetWare* use, so we did not test it under NetBench.) For processor scalability, we also tested four symmetrical servers—from Acer, ALR, Compaq, and Digital—with the *Oracle* database package under SCO MPX 2.0, a multiprocessor version of Unix. (By doing so, we were able to add processors and see corresponding increases in performance.) We did not test the PowerFrame for processor scalability because at the time of review, the system supported only SCO MPX 1.0. Version 2.0 became available in mid-April.

Ideally, doubling the number of processors might double the server's performance; but none of the platforms tested achieved this ideal when we added a second processor. The applicationDEC showed the best scalability, a 47 percent increase in processor performance under *Oracle* testing. Acer, already quite fast with a single processor, improved 14 percent, giving Acer and Digital roughly equivalent two-processor database server performance. The Systempro and its ALR clone were memory-bound and were actually slower with two processors installed, providing less than half the transaction-processing throughput of the Acer and Digital systems.

Still, all of these platforms were far more powerful than either of the Compaq Deskpro/M PCs we tested for comparison. These super servers have the price tags to match, starting at \$29,505 for the

AcerFrame (with 48MB of RAM and 1.8GB of storage) and topping off at nearly \$100,000 for the NetFrame (with 48MB of RAM and 3.2GB of storage).

If you want a file server for 100 users, be sure that the server has three features: lots of disk drives (12 to 16); processors dedicated to handling I/O; and a high-speed bus that connects the memory, processor, and I/O. The NetFrame and PowerFrame are the only two reviewed platforms offering all of these features.

If you don't need to support hundreds of users, you might consider running a fast 486 with plenty of I/O as a file server. You won't be able to support as many users on a single machine, nor will you get the reliability of a super server.

What you will get is a comparatively inexpensive solution that can adequately support between 50 and 70 workstations per server, depending on factors such as the number of requests, the size of those requests, and the configuration of the given machine. (For more information, see "486/33 File Servers," March 17, 1992, where we cover single-processor file servers.)

REVIEW CRITERIA

During our research, we identified more than a dozen multiprocessing units that we could classify as super servers, but we narrowed that number down to the six that offer multiple processors, have a strong following in the U.S., and support either *NetWare*, Version 3.11, or SCO MPX 2.0. The Santa Cruz Operation's multiprocessing version of Unix. Note that because these systems are quite different in their architectures and abilities, and because we could not test each system in every environment, we are not awarding an Editors' Choice in this review.

Because each server needed support for either SCO MPX 2.0 or *NetWare* to run the performance tests, we eliminated Parallax's Server 290, a powerful super server dedicated to Microsoft's *LAN Manager* and IBM's version of that network operating system, *LAN Server*.

And though we covered file servers

that ran Unix, we did not review SPARC-based machines from companies like Sun Microsystems and Auspex Systems.

All the vendors in this review have a U.S. customer base. Companies like Apricot, American Mitac Corp., Integrated Business Computers, and Siemens/Nixdorf all make multiprocessing servers that sell well in foreign markets but lack a significant presence in this country. Re-

quiring such a presence may seem unusual, but if you purchase a super server, the vendor's support system is as important as the hardware platform itself. Part of ensuring top-quality support is maintaining a large-enough customer base to justify that investment.

Both Everex Systems and NCR Corp. sell servers that meet our criteria (the STEP MP and Star-Server series, respec-

tively), but the companies did not send systems in time to meet our deadline.

The six vendors that did participate in the review were asked to equip their servers with a minimum of 48MB of RAM and at least 1.3GB of internal storage. We set no maximum on either memory or storage. Each server was equipped with two 10BaseT (unshielded twisted-pair Ethernet) cables and two Token-Ring network adapters rated at 16 megabits per second.

All the vendors but ALR and NetFrame sent servers with dual 33-MHz 486 processors. ALR provided dual 486/50 processors; the NetFrame, which supports only one general-purpose processor but a host of CPUs to manage other functions, was equipped with a 25-MHz 486 chip. A 486/33 processor is available on the NetFrame NF450FT, which was still in beta at the time of our testing.

SYMMETRICAL VS. ASYMMETRICAL

The vendors that provided dual-processor machines use architectures that are mostly symmetrical, though the PowerFrame and Systempro add some asymmetrical elements. Only NetFrame makes a purely asymmetrical server.

The differences between symmetrical and asymmetrical file servers are significant. In a symmetrical file server, processors share access to system resources such

The six servers came with a minimum of 48MB RAM, at least 1.3GB of internal storage, two 10BaseT cables, and two Token-Ring adapters.

as memory and I/O. In contrast, an asymmetrical file server dedicates individual, specialized processors to different system resources. One processor may handle I/O requests, while a second processor moves data in and out of memory, and a third services network operations.

There are benefits and drawbacks to both approaches. With symmetrical multiprocessing, file servers can exhibit near-linear growth in performance. For each processor that's added, the server can in theory process that many more transactions.

The problem with symmetrical multiprocessing is that all processors must perform all commuting functions and cannot be optimized for a given task. A costly 486 chip, for example, may be needed for data-crunching, but a less powerful chip can sufficiently govern memory and I/O access. Yet under a symmetrical architecture, it is the 486 that will be used.

Asymmetrical multiprocessing servers enable specialized processors to be dedicated to a given task, such as accessing the hard disk subsystem or moving data. The NetFrame, for instance, uses a single 486 CPU to process data; but separate I/O processor boards (IOPs), each containing an Intel 376 chip (an inexpensive variant of the 386SX), manage the network cards and the disk controllers. Asymmetrical multiprocessing systems typically show excellent I/O throughput, but they may lack the processor scalability of symmetrical machines.

The PowerFrame and Systempro in this review combine both symmetrical and asymmetrical elements in their designs. In both instances, the servers are symmetrical because two or more main processors are used for running applications. The processors share a common memory bank and can access system resources equally. These two servers are asymmetrical in relation to their hard disks, however: the Systempro's Intelligent Drive Array controller uses an Intel 186 processor to move data to the disk, and the PowerFrame contains two Intel 386 Intelligent I/O Processors to manage the same task.

MULTIPROCESSING IN SOFTWARE

Full exploitation of these different platforms requires specialized operating systems and software, though the only available multiprocessing operating systems for PCs are SCO MPX 2.0, VINES SMP,

and some customized versions of *LAN Manager* and *NetWare*. (Microsoft and Novell have promised symmetrical multiprocessing support for Windows NT and *NetWare*, respectively, but neither is available yet.)

Like the hardware, multiprocessing operating systems can be either symmetrical or asymmetrical. The difference lies in how they allocate tasks to the different processors.

Asymmetrical operating systems dedicate tasks to particular processors. One processor may handle network requests, while a second handles the file system.

HIGHLIGHTS

With as many as half a dozen processors, proprietary high-speed buses, and gigabytes of disk space, super servers can offer enough power to drive the largest corporate workgroups.

ZD Labs tested six super servers from Acer, ALR, Compaq, Digital, NetFrame, and Tricord as file and database servers. We tested all but the applicationDEC 433MP for I/O scalability under *NetWare* 3.11, and all but the NetFrame NF 400 Network Mainframe and Tricord PowerFrame 40.33C for multiprocessing scalability under Unix.

Each had better I/O throughput and scalability than the Compaq Deskpro/MS we tested for comparison. The NetFrame and the PowerFrame showed the best performance under *NetWare*, especially with large numbers of users.

The AcerFrame 3000 MP33 and applicationDEC 433MP shined when they ran the Multiprocessor Database test, but the ALR PowerPro SMP 512 486/50 and Compaq Systempro 486-2040 showed the same flaw: a decrease in CPU performance when we installed a second processor.

Client stations on ZD Labs' tests stress the server more than many networked PCs do—sometimes twice as much. Business users may therefore get better performance than our tests indicate. ■

Though *NetWare*, Version 3.11, is currently sold as a uniprocessing operating system, NetFrame has added extensions to make *NetWare* an asymmetrical operating system. Microsoft also built asymmetrical extensions for *LAN Manager*, Version 2.0, but those were not available for Version 2.1.

Asymmetrical network operating systems can run over both asymmetrical and symmetrical hardware platforms. These operating systems are, however, most efficient in an asymmetrical machine, where vendors can closely match the needs of the operating system to the capabilities of a particular processor.

The potential problem with asymmetrical operating systems lies in their failure to balance the workload adequately across all system resources: One processor may lie idle while work saturates another processor. Symmetrical operating systems solve this problem, though they are far more difficult to design. A portion of code, called a scheduler, allocates tasks dynamically to the most available processor. Since any processor will process any request, a symmetrical operating system requires symmetrical platforms, like the ones used by Acer, ALR, Compaq, Digital, and Tricord.

ASSURING RELIABILITY

Scalability is not the only area that distinguishes the super servers in this review from regular PCs. With hundreds of workstations relying on the server, building reliability and management features into the server becomes ever more crucial.

Traditionally, PCs have lacked reliability features. The ubiquitous "power-on self-test" is about the extent of an ISA-based PC's diagnostic capability. EISA machines are slightly better; they ensure that the attached peripherals are operating correctly.

Even so, few EISA machines can automatically isolate a failed memory bank or detect a memory error. On small networks with little RAM capacity, some of these problems are unlikely to occur; but when the server employs tens of megabytes of RAM, the potential for data corruption increases dramatically.

During the past year, two significant trends have emerged, which increased the reliability of PC file servers. Super servers now offer fault tolerance in the most vulnerable area, the hard disks. Though disk mirroring and duplexing offered fault tolerance in the past, today many disk

subsystems offer data striping and parity checking, known as RAID (redundant arrays of inexpensive disks).

RAID specifies five different levels of error correction and data protection. RAID-1 refers to disk mirroring, where the server writes the same data to two hard disks on one controller, and disk duplexing, where the two hard disks exist on separate controllers. The remaining four RAID levels use two techniques, parity checking and data striping, to improve reliability and performance, respectively, without having to double the disk capacity. Parity checking uses an extra bit of data to ensure that the information transmits accurately; data striping involves spreading data, by bytes or sectors, across many disks. Data striping improves I/O performance; parity checking allows information to be restored in the event that a hard disk crashes. While this may not be important in small networks, the higher RAID specifications can be crucial in large networks where several gigabytes of data may be required.

SERVER MANAGEMENT

The second feature that distinguishes super servers from ordinary PCs is the movement of sophisticated server management onto less costly platforms. Originally, only the NetFrame enabled the file server to notify the network administrator when the server failed. Now that capability can be found on a management card designed for the Systempro. Still, the NetFrame's more sophisticated capabilities, like the ability to look inside at the server and monitor CPU, bus, and memory utilization, are not offered by any other vendor.

The super servers themselves vary widely on the reliability features that are built into the server. All of the servers reviewed, with the exception of the AcerFrame and the ALR, support the RAID specification.

Three vendors—Acer, Digital, and NetFrame—offer ECC (error correction code) memory to detect and correct memory errors. NetFrame and Tricord also offer redundant hard disk controllers and drive paths to ensure greater fault tolerance. Acer also offers an optional internal uninterruptible power supply.

If you're delirious for reliability, look at the NetFrame. Its reliability features may be a harbinger of things to come. First is parity checking on the bus. This enables the server to detect any errors that may occur while data is traveling between its different components—from the CPU to memory and back.

NetFrame has also dedicated a processor to managing the server. This processor enables you to monitor such parameters as CPU utilization and the temperature inside the server. The processor also runs an extensive self-test, called Power System Sequencing, which performs such functions as synchronizing the hard disks' drive heads, to ensure that the main processor can communicate with those hard disks. Power System Sequencing also minimizes the time needed to fix a component failure by pinpointing the problem's location. Finally, each NetFrame undergoes a

heavy burn-in procedure to isolate problems before the unit is shipped.

Of course, even the most sophisticated fault-tolerant features will fail at some time. Then the only thing that matters is isolating and repairing the problem quickly. Easier said than done.

Some of the servers in our review made repairs a breeze. Others made repairs a nightmare. The AcerFrame, for instance, was especially difficult to disassemble when ZD Labs tried to inspect its components. We had to remove four separate panels to access the server's innards. In contrast, the PowerPro and Systempro were the easiest to troubleshoot. Finally, be sure that the server you buy has good, strong casters. Without them, moving the unit (which can weigh as much as 130 pounds) can be a real pain.

NOTES ON TESTING

The products that made it into our review underwent two suites of tests:

- A file server test, NetBench, which uses *NetWare*, Version 3.11;
- A multiprocessor database test from Oracle Corp., using the SCO MPX 2.0 operating system.

NetBench looks at I/O scalability under

NetWare. It is a stress test aimed to find the point at which a server's hard disk access begins to slow down. The test issues reads from and writes to the server in a 3:1 ratio. The test is run once with a 512K file and a second time with a 1MB file. We used a standard version of *NetWare*. All of the platforms except for the applicationDEC, which does not support *NetWare*, participated in the NetBench test.

The *Oracle* test stresses the limits of the server's processing capability. This test issues as many as 20 transactions per second; in other words, the database is being viewed, updated, or otherwise accessed as many as 20 times each second. Under normal usage, servers rarely undergo the kind of stress generated by this test. This test was run on the AcerFrame, applicationDEC, PowerPro, and Systempro. The NetFrame does not support SCO Unix, and SCO MPX 2.0 was not available for the PowerFrame until mid-April; we therefore did not have either system perform this test.

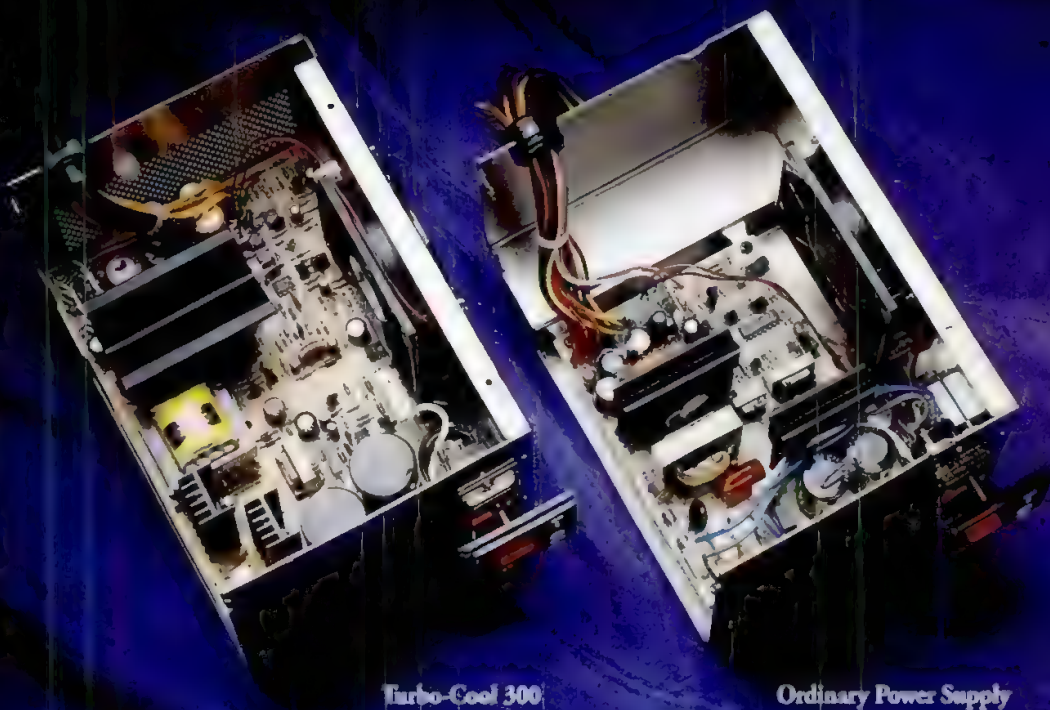
On the NetBench test, all the systems performed better than the Compaq Systempro, which lost steam when it ran the NetBench test with more than 48 workstations. Only the NetFrame and PowerFrame sustained their high level of I/O throughput when tested with a 1MB file and 96 workstations. The rest of the systems slowed dramatically when ZD Labs ran them through the 1MB NetBench test with more than 48 workstations.

An important note: The workstations on our file-server tests heavily stress the file server. Each workstation on ZD Labs's test-bed generates as much traffic as two or more workstations on a normal office network. Thus, where we note that a super server's performance falls off after 48 or 72 users, this does not imply the super server is incapable of serving a real-world network with that many users. In fact, it might be able to handle several times as many users. Whether it's twice as many users or five times as many users depends on how heavily the PCs stress the network, and how much performance degradation users will accept.

Some of the servers reviewed may in fact perform better under NetBench if a patch is applied to *NetWare*. Currently, *NetWare* is a bottleneck when there is a high number of reads per second. The patch compensates for the increased number of writes by changing *NetWare*'s queuing algorithm, giving priority to the

LOOK AT THE INSIDE STORY ON POWER SUPPLIES.

What power supply is inside your computer? If you are like most people, you don't know, and frankly, don't care. But, because your computer's power supply is a critical system component, what you don't know, may hurt you. An inferior power supply can cause interference, rebooting, hard drive errors, and other nasty hard-to-track problems. So why take chances? Call the power supply specialists at PC Power and Cooling today.



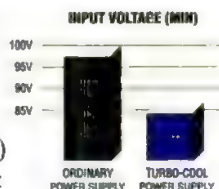
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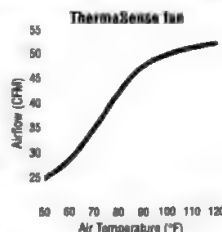
A dual-stage output filter ensures that sensitive computer chips receive pure, low-ripple power.

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Our units offer the most complete protection from dangerous overvoltage, overcurrent, and short circuit conditions.

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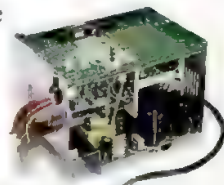
Our high-capacity units are safety approved by not only UL, but also by Canada's CSA and Germany's strict TUV.

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Turbo-Cools are designed and tested for MTBFs of over 100,000 hours. They come with a no-hassle 2-year warranty and a 30-day money-back guarantee.

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CIRCLE 080 ON READER SERVICE CARD

read requests. The patch is currently available on NetWare, Novell's CompuServe forum, as 311PT2.ZIP.

For Oracle testing, the application-DEC showed the best processor scalability: Adding a second processor boosted performance by 47 percent. The AcerFrame showed a 14 percent gain, and the PowerPro and Systempro both experienced 12 percent performance decreases because of memory bottlenecks. Though some products, like the PowerPro and Systempro, showed poor scalability under the Oracle test, they would probably fare better if the I/O and memory operations were mixed.

PRODUCT CHOICES

Choosing a super server is not an easy task. It requires a clear understanding of your needs, not just in terms of the system's duties, but in terms of security, reliability, and performance. In the six reviews that follow, you'll find computers that are the most appropriate as file servers when a standard PC loses steam, and you'll find those whose makeup makes them best suited to run databases. In these articles, we'll touch on these points and explain in greater depth how they relate to each product.

All reviews by Robert W. Kane and David J. Frerichs

ACER AMERICA CORP.

AcerFrame 3000 MP33

The AcerFrame 3000 MP33 packs powerful technology into a case that is extremely hard to service. For \$29,505, you get two 486/33 processors, each with 128K of write-through cache; 48MB of system memory; three 634MB SCSI hard disks connected to a DTC 3290AS EISA SCSI bus-mastering caching disk controller with 4MB of memory; two Novell NE3200 EISA Ethernet boards; two EISA 16/4 Token-Ring non-bus-mastering boards; and a 430-watt power supply.

ARCHITECTURE

The AcerFrame is a symmetrical multiprocessor server that uses a proprietary, 64-bit-wide system bus for the CPU and memory (Acer America Corp. calls it the FrameBus) and a standard EISA bus for I/O. The motherboard has 14 slots. Four of these are processor slots that can accept 486/33 or 486/50 processor boards; eight

are EISA slots, one is an ISA slot, and one is a combination ISA and memory slot. The system can support as much as 256MB of memory. Unlike systems from Compaq, NetFrame, and Tricord, there are no additional, special-purpose processors to control other functions.

Acer sent us three full-height SCSI devices attached to a DTC caching disk controller—an arrangement that proved detrimental to the AcerFrame's NetWare performance when compared with other reviewed systems using a larger number of smaller hard disks. Acer's internal RAID-5 system (which incorporates the Acer Disk Array Controller) was not yet shipping at the time we ran our tests, but it should be available by the time you read this and will most likely help performance.

This super server is designed with several fault-tolerant features. It comes with ECC (error correction code) memory as well as standard memory parity checking, and you can order it with an internal UPS that automatically forces a graceful shutdown in the event of a power failure. Together with the optional internal RAID-5 disk system, these features give the AcerFrame 3000 MP33 the resources to deal with most mission-critical applications.

PERFORMANCE

Tested as a file server under NetWare, the AcerFrame showed low throughput (for a

super server) and a drop-off in performance when we tested the system with more than 48 workstations. Its most limiting factor was the hard disk configuration, which consisted of only three units—the fewest of the reviewed systems. In addition, using the EISA bus to get information from the disk controller's cache caused a bottleneck, and CPU utilization was not nearly as efficient as it could have been. These factors gave the AcerFrame the lowest and second-lowest peak throughput when using 1MB and 512K file sizes, respectively, under NetWare.

On our

Multiprocessing

Database test, the

AcerFrame showed the highest single-processor throughput of any of the systems tested.

On our Multiprocessor Database test, however, the AcerFrame showed above-average performance and scalability. When we ran this test with one processor, the AcerFrame showed the highest single-processor throughput of any of the four systems tested, 16.7 transactions per second, compared with the applicationDEC 433MP's second-place 13.2. We attribute this high throughput to the 64-bit path of Acer's FrameBus architecture. The company says you can't really see the AcerFrame's efficiency until you add more than one processor. The second processor increased Acer's performance 14 percent to 19.1 transactions per second, but the change was not as dramatic as that of the applicationDEC 433MP, which improved 47 percent to 19.5 transactions per second. Compared with the Compaq and ALR systems, the AcerFrame and applicationDEC 433MP were about twice as fast at transaction processing.

SERVICEABILITY

The AcerFrame promises easy serviceability, but this depends largely on what parts need servicing. To reach many of the components, we had to disassemble several other components.

Getting inside is easy enough: Undo the case key lock and the top panel slides off, tripping an interlock switch that powers off the system. The two side panels also slide off, giving you unrestricted access to the motherboard. But it is only until this point that the AcerFrame lives up to its billing as a "one-piece screwless unit."

On the other side of the case are eight



FACT FILE

AcerFrame 3000 MP33
 Acer America Corp., 2641 Orchard Pkwy.,
 San Jose, CA 95134, 800-733-2237,
 408-433-3622; fax 408-432-6221.
List price (tested configuration): \$29,505.
Configuration: Two 486/33 processors,
 48MB RAM with 128K write-through cache,
 three 634MB Seagate ST6787N SCSI hard
 disks, one 1.2MB Matsushita and one 1.44MB
 Sony floppy disk drive, one Data Technology
 Corp. 3290AS 32-bit SCSI controller, 4MB
 cache, two Novell NE3200 EISA Ethernet
 NICs, two Olicom 16/4 Token-Ring NICs,
 430-watt power supply.

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C size



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At last. A personal output device that combines the best features of a desktop laser printer with the ability to produce large format drawings. It's called ProTracer — a 360 dpi desktop printer/plotter that produces A, B, as well as C-size output.

ProTracer's speed and quiet operation come from the latest Canon inkjet technology and an Intel i960 processor. Drawings that take up to half an hour to print on a pen plotter take only five minutes on ProTracer!

And, unlike other large format devices, ProTracer isn't limited to plotting. Start with the ProTracer base unit that incorporates resident IBM ProPrinter and Epson LQ-1050 emulations, as well as an ADI plotter driver for AutoCAD users. Then, depending on your needs, choose from a variety of optional accessories includ-

ing HP-GL® and PostScript® language emulation cards.

Optional Printer Accessories

HP-GL emulation card	\$399
PostScript language emulation card	\$499
2 MB memory upgrade	\$299
4 MB memory upgrade	\$499
8 MB memory upgrade	\$899
Sheet feeder I (100 sheet)	\$149
Sheet feeder II * (100 sheet)	\$129
PacificTalk (AppleTalk interface module)	\$199

* Sheet feeder I is required for use

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COMPUTERS

SUPER SERVERS



SUMMARY OF FEATURES

Products listed in alphabetical order by company

☒ Yes ☐ No

	AcerFrame 3000 MP33	ALR PowerPro SMP 512 486/50	Compaq Systempro 486-2040
List price (PC Magazine configuration)	\$29,505	\$32,552	\$51,272
PROCESSORS AND MEMORY			
Main processors supported, installed	4, 2 (486/33s)	2, 2 (486/50s)	2, 2 (486/33s)
Special-purpose processors	None	None	None
Installable RAM	8MB-256MB	5MB-49MB	4MB-256MB
Installed RAM cache	128K	512K	512K
EXPANSION BUS			
CPU bus structure	64-bit FrameBus	32-bit ALR Systempro-compatible	32-bit Compaq Flex MP
I/O bus architecture	EISA	EISA	EISA
32-bit bus-mastering slots	6	6	5
32-bit non-bus-mastering slots	2	2	2
32-bit proprietary slots	None	2 CPU	4 CPU/memory
Other slots	6 FrameBus, 2 64-bit ISA	2 32-bit ISA	None
DISK DRIVES			
Maximum number of installable drives	8	8	11
Drive manufacturer	Seagate	Maxtor	Conner
Rated access time (milliseconds)	12	12	12
Drive array:			
RAID level supported	5	N/A	1, 4 equivalent
RAID implementation	Hardware	N/A	Hardware
Capacity per drive	634MB	535MB	510MB
Net data capacity	1.8GB	2GB	4GB
Maximum number of drives supported	16	4	8
Hard disk interface	EISA SCSI	EISA SCSI	Proprietary
POWER SUPPLY AND COOLING			
Number of power supplies installed	1	1	1
Power supply (watts)	430	300	355
Internal UPS	Optional	☒	☒
Number of fans installed	3	1	1
SOFTWARE			
Primary operating system	NetWare 3.11, SCO MPX, VINES	DOS	DOS, NetWare 3.11
Unix support	SCO Unix 3.2.4 with MPX 2.0	SCO Unix 3.2.4 with MPX 2.0	SCO Unix 3.2.4 with MPX 2.0
DOS support	☒	☒	☒
NetWare 3.11 support	☒	☒	☒
Other operating system support	OS/2, SCO Xenix	OS/2, VINES	OS/2, SCO Xenix, VINES
FAULT TOLERANCE			
Fault-tolerant operation/On-line repair:			
Processors	☒	☒	☒
Drives	☒	☒	☒
Controllers	☒	☒	☒
Power supply	☒	☒	☒
Failure notification	LCD on front panel	On-screen	Audio, on-screen
SERVER MANAGEMENT			
Separate processor	☒	☒	☒
Remote notification	☒	☒	Optional
Temperature sensor	☒	☒	☒

N/A—Not applicable: The product does not have this feature.

C-bus—Corollary bus, MPX—multiprocessing extension, I/O—Intelligent I/O Processors, MPSA—Multiprocessing Server Architecture, RAID—redundant array of inexpensive disks.

COMPARISON SUPER SERVERS

Digital Equipment Corp. applicationDEC 433MP

\$39,603

4, 2 (486/33s)

None

8MB-64MB

256K

32-bit standard C-bus

EISA

5

2

9 C-bus

None

9

Digital

14

1, 5

Software

426MB

40.7GB

6

EISA SCSI

1

550

2

SCO Unix

SCO Unix 3.2.4
with MPX 2.0

■

■

None

■/■

■/■

■/■

■/■

On-screen

■

■

■

NetFrame NF400 Network Mainframe

\$98,370

1, 1 (486/25)

1 Intel 376

16MB-64MB

32K

64-bit NetFrame

MPSA

NetFrame MPSA

None

None

None

8 8-bit I/O

Processor/application

16

Maxtor

13.5

N/A

N/A

200MB

3.2GB

16

SCSI-2

2

1,500 (total)

■

4

NetWare 3.11,

Microsoft LAN Manager

N/A

■

■

Microsoft LAN Manager

■/■

■/■

■/■

■/■

Audio, on-screen, remote

■

■

■

Tricord PowerFrame 40/33C

\$70,385

2, 1 (486/33s)

2 386 I/Os

8MB-128MB

256K

32-bit PowerBus

EISA

6

1

5 PowerBus

1 8-bit ISA

12

Fujitsu

12

1, 3, 5

Software

329MB

4GB

12

I/O EISA SCSI

3

1,000 (total)

■

2

DOS, NetWare 3.11

SCO Unix 3.2.4

with MPX 2.0

■

■

OS/2, VINES

■/■

■/■

■/■

■/■

Audio, on-screen, remote

■

■

■

half-height drive bays, four of which can be configured for eight 3.5-inch half-height devices for the optional internal drive array. But in order to gain access to all the drives, you must remove the front panel, which involves removing two screws and a dampening arm for the front panel door.

PROPER COOLING, POOR ACCESS

Acer went to great lengths to ensure the system had proper air circulation, placing a fan directly behind the drives to keep them cool while in operation. Unfortunately, this fan, together with the power distribution block for the drives, effectively restricts access to the back of the drives if you want to remove and replace the drives' power and interface cables. The only way to gain access to these connections is to remove the part of the chassis that serves as the mount for the drives themselves—held together by another ten screws.

To Acer's credit, it used two locking casters in front, and all four casters roll easily when you need to wheel the system around.

The AcerFrame 3000 MP33 is reasonably priced, offers a step up from a standard server, and shows fine transaction-processing ability.

ADVANCED LOGIC RESEARCH INC.

ALR PowerPro SMP

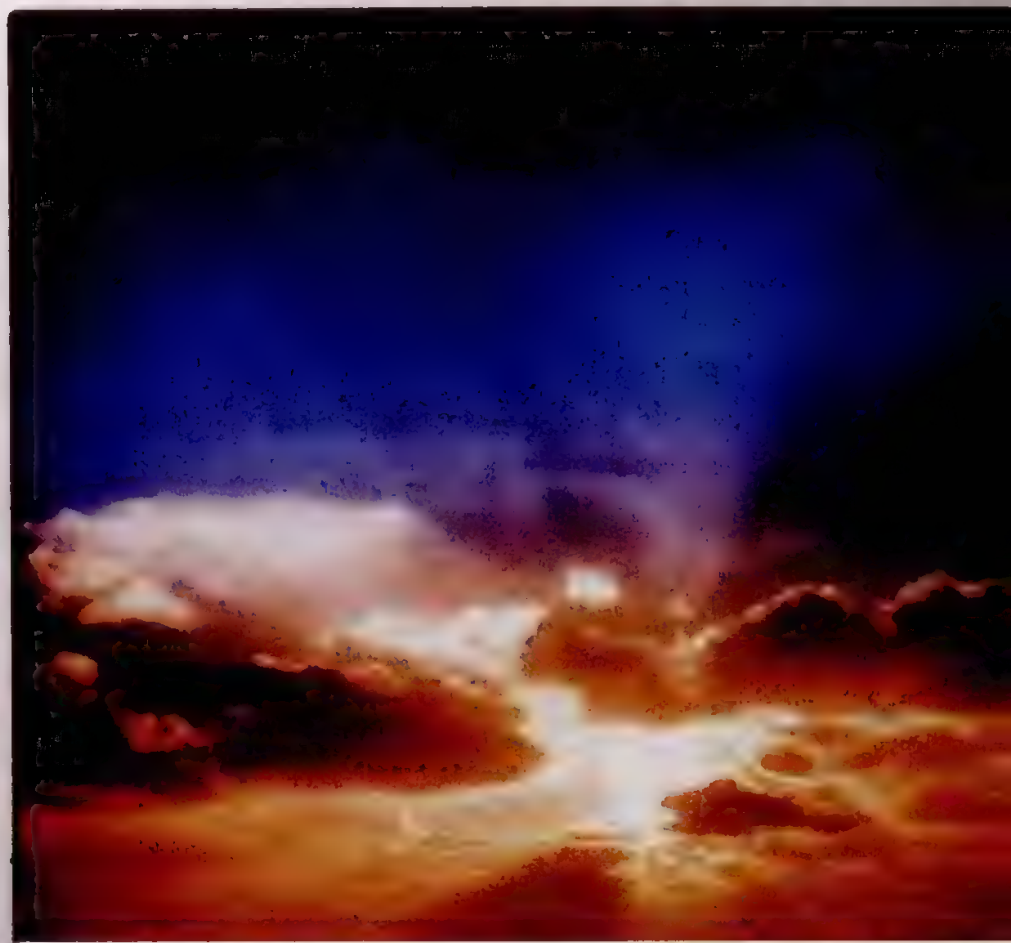
512 486/50

The ALR PowerPro SMP 512 486/50 sets out to do everything the Compaq Systempro 486-2040 does, and at a lower price. Advanced Logic Research's \$32,552 offering is register-level-compatible with the Systempro, right down to replicating a performance bottleneck.

The PowerPro has 49MB of system memory, 2.14GB of disk storage on four hard disks, two Novell NE3200 Ethernet cards, two Madge EISA 16/4 Smart Token-Ring Ringnode adapters, and two 486/50 processor boards with 512K of 25-nanosecond second-level cache. The price includes a VGA board, monitor, and keyboard.

The PowerPro can accept either a 486/33 or a 486/50 processor, with or without second-level cache. Although it is touted as a Systempro clone, processor boards are not interchangeable between ALR and Compaq units.

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Introducing
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486SX
notebook
with
TFT color.

T4400SXC

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You are about to witness an incredible display of power. Introducing the Toshiba T4400SXC. The first notebook to offer you all the power of a 486SX with all of the jaw-dropping possibilities of TFT LCD active matrix color.

Consider that with its active matrix Super VGA color screen, the T4400SXC can actually display a kaleidoscope of 256 simultaneous colors at a 640 x 480 pixel resolution.

Remarkably, these 256 colors can be drawn from a palette of 185,000 colors to give life to photographic images and color intensive presentations. It's enough to make your retina want to take a vacation.



Not to mention that each pixel on the screen is controlled by three individual transistors, ensuring perfect focus and color registration. The result is amazing

clarity far superior to desktop monitors and a brighter, faster screen that far exceeds passive matrix LCD color screens.

Combined with a blazing 25MHz, 486SX microprocessor and 8K internal cache, it's powerful enough to handle your wildest visions.

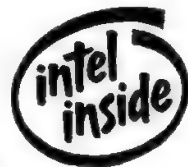
Of course, you shouldn't be limited by the number of ideas you have either. Which is why the T4400SXC is equipped with a 120MB hard drive for plenty of storage. And 4MB of RAM expandable to 20MB.

And since ideas happen anywhere, any time, we've designed it to fit in half of a briefcase and given it a Nickel Cadmium battery that lasts 3 hours per charge.

Of course, there are times like payday when it is necessary for you to be in the office. Which is why we made our new notebook to be expandable with our Deskstation IV, giving you two expansion slots, and ports for external monitor and external keyboard.

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We think you'll find that when it comes to the future of personal computing, Toshiba has incredible vision.



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PERFORMANCE TESTS

For NetWare 3.11 I/O scalability on large networks, the NetFrame NF400 Network Mainframe and the Tricord PowerFrame 40/33C were superior performers. On the Multiprocessor Database test, the AcerFrame 3000 MP33 and the applicationDEC 433MP turned in the best scores; the ALR PowerPro SMP 512 486/50 and Compaq Systempro 486-2040 showed poorer performance with two processors than with one.

HOW WE TESTED

To measure super server performance under NetWare, Version 3.11, ZD Labs ran NetBench, Version 1.0, with varying file sizes and workstation loads. We also ran a Multiprocessing Database test to measure CPU scalability under Unix. Specifically, we used The Santa Cruz Operation's SCO Unix, Version 3.2.4, with SCO's Multiprocessing Extensions, Version 2.0 (SCO MPX 2.0), and Version 6.0.33.1 of the Oracle multiprocessing database package. NetBench tests I/O scalability—the server's performance as the number of workstations increases—under NetWare; the multiprocessing database test shows CPU scalability, the performance difference when a second CPU is added to a symmetrical multiprocessing super server.

Only three super servers in this review could run both tests: the AcerFrame 3000 MP33, ALR PowerPro SMP 512 486/50, and Compaq Systempro 486-2040. Because the NetFrame NF400 Network Mainframe does not support Unix, and Tricord Systems was not yet shipping its own version of SCO MPX 2.0 for its Tricord PowerFrame 40/33C, we did not test either system for its CPU scalability under our multiprocessor database test. Similarly, because Digital Equipment Corp. does not recommend its applicationDEC 433MP for NetWare, we did not run our NetBench tests on that system. We also ran NetBench on two Compaq Deskpro/M PCs—a 486/33 and a 386/25—for comparison.

NETBENCH TESTING

ZD Labs' NetBench, Version 1.0, reveals how well each machine performs under an increasing load, in terms of I/O scalability and peak throughput.

We tested each super server with 8, 16, 24, 48, 72, and 96 workstations to show how much throughput it can achieve, at

what point it peaked, and at what point (if any) it showed a sudden drop in performance.

In one phase, NetBench shows increases and decreases in throughput as workstations are added to the network. We ran this test using a 1MB file and a second time using a 512K file.

In another phase of this test, NetBench measures system throughput under a 96-workstation load with increasing file sizes: 512K, 1MB, 2MB, 4MB, and 8MB. The file size indicates how much the disk space is used during the test; the larger the file, the farther the disk heads have to move to read and write data.

MULTIPROCESSOR DATABASE TESTING

The Multiprocessor Database test determines the robustness of each server's multiprocessing architecture. The results can be interpreted as relative server performance under extreme load conditions.

The database test runs almost completely within the system bus and has essentially no I/O. Because most of the instructions are reads from or writes to memory, the benchmark test is considered a combination CPU-and-memory test. Testing under this strategy reveals the bandwidth of the system bus and the efficiency of the server's cache algorithm.

The test gauges each workstation's performance with one CPU active and then with two active. For this review, we ran the full test (single- and dual-processor) three times on each system. We dropped the high scores from each part of the test and averaged the two lowest scores for each part to come up with the one- and two-processor scores. SCO Unix MPX 2.0 was always loaded and active.

WHAT THE NUMBERS MEAN

I/O SCALABILITY UNDER NETWARE

The NetFrame NF400 Network Mainframe and the Tricord PowerFrame 40/33C scaled equally well, sustaining their relative throughputs in a near-parallel manner. Their throughput curves showed no sudden drop in performance, and the degradation that was present was extremely linear.

The ALR PowerPro SMP 512 486/50 showed slightly better I/O scalability than the Compaq Systempro 486-2040. In stark contrast with the NetFrame and the PowerFrame, however, these two super servers showed sudden drops in performance. When they ran NetBench with a 1MB file, performance began to plummet between 48 and 72 workstations; with a 72-workstation load, the systems bottomed out. When tested with 512K files, these two

systems did somewhat better: They scaled well through 72 workstations but lost performance when tested under a 96-workstation load.

The two Compaq Deskpro/Ms that we tested for comparison scaled worse than all the others. Though the 486/33 Deskpro/M showed a higher peak throughput than the AcerFrame 3000 MP33 and the NetFrame, its performance peaked with a 24-workstation load and bottomed out at 72 workstations. Likewise, the 386/25 Deskpro/M bottomed out at the same point.

Three machines are comparable in terms of peak throughput when dealing with a 1MB file: The PowerFrame, PowerPro, and Systempro all peaked at slightly less than 25 megabits per second (Mbps) with 24 workstations. The 486/33 Deskpro reference machine edged out the NetFrame, turning in 21-Mbps throughput. The AcerFrame turned in the lowest peak throughput—even lower than the 25-MHz 386-based Deskpro/M we used for comparison. The AcerFrame peaked at about 16 Mbps.

On the 96-workstation portion of the NetWare 3.11 Throughput test, all five systems showed the sharpest decline in throughput when we increased the file size from 512K to 1MB. The PowerFrame showed better performance and scalability than the other systems: Its throughput was highest, and it showed marginally less performance degradation when we increased the file size from 512K to 8MB.

CPU SCALABILITY UNDER SCO MPX

Only the AcerFrame 3000 MP33 and the Digital applicationDEC 433MP showed good scalability under our Multiprocessor Database test. The Systempro and the Systempro-compatible PowerPro showed a slight performance degradation when tested with two processors.

Though the applicationDEC showed the best scalability—a 47 percent increase, from 13.2 to 19.5 transactions per second (tps) when we added a second processor—its actual performance was only slightly higher than that of the AcerFrame, which showed a 14 percent increase, from 16.7 to 19.1 tps.

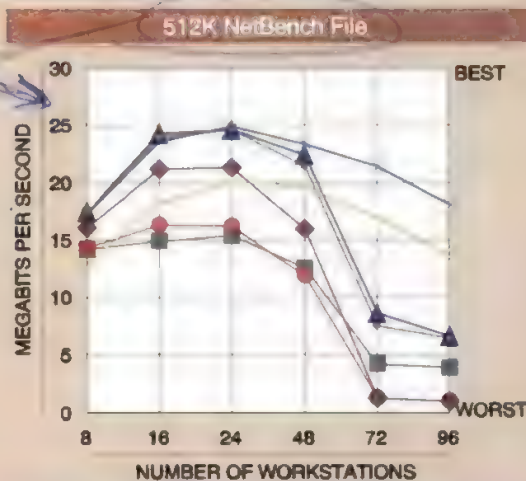
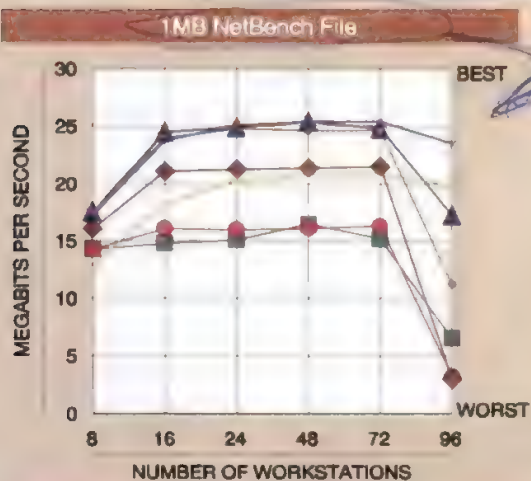
Compared with the AcerFrame and applicationDEC, the PowerPro and Systempro, which use compatible system architectures, showed considerably poorer performance. These two systems were completely memory-bound under the load created by the performance tests; in other words, the memory system could not handle any more transactions. When a system becomes memory-bound, adding another processor yields no increase in performance, and the overhead actually degrades performance slightly.

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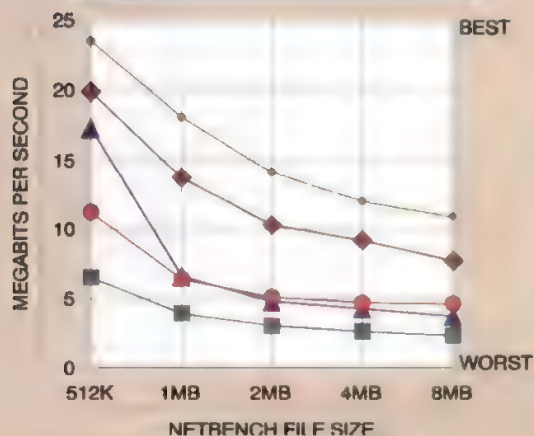
■ **NetWare 3.11 Throughput**, as measured by ZD Labs' NetBench, Version 1.0, is an indication of each server's I/O capabilities in terms of peak throughput and scalability. Scaling is achieved by changing the number of workstations attached to the server. Four separate network segments are used (two 10BaseT Ethernet and two Token-Ring), with equal numbers of workstations on each segment.

■ The **Multiprocessor Database** test shows the super server's CPU scalability, the performance change that occurs when a second processor is added. Each machine is configured with two 486 processors and at least three logical drives. We load SCO Unix 3.2.4, SCO MPX 2.0.0, and the SCO Unix Development System into the root drive, and we put the Oracle database package on a separate drive. Each server performs the test with one processor and then with two processors.

NETWARE 3.11 THROUGHPUT

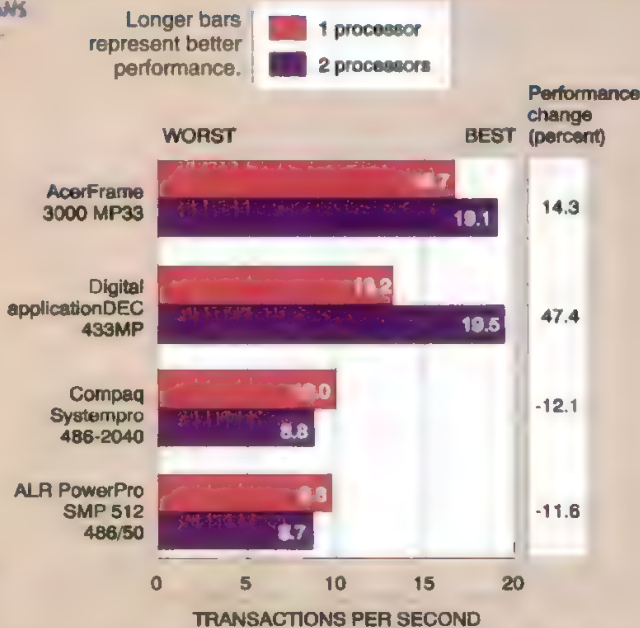


NETWARE 3.11 THROUGHPUT



We did not test the Digital applicationDEC 433MP under NetWare.

MULTIPROCESSOR DATABASE



We did not run the Multiprocessor Database test on the NetFrame NF400 Network Mainframe and the Tricord PowerFrame 40/33C

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PC Magazine, April 28, 1992*

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PC World, April 1992*

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ARCHITECTURE

The PowerPro's CPU bus is compatible with the Systempro bus and uses an EISA bus for I/O. With eight EISA slots and two processor slots, the PowerPro has one less expansion slot than the Systempro. Unlike the Systempro, which takes proprietary memory modules, the PowerPro uses standard SIMMs on its motherboard. It comes with 1MB, and filling the 12 SIMM sockets with 4MB SIMMs brings the total system memory to 49MB (the other systems' maximum RAM capacities range from 64MB to 256MB). While 49MB is still a good amount for a file server, some server database applications may need more.

One area in which ALR did not copy Compaq was the hard disk system. Instead of trying to duplicate Compaq's IDA (Intelligent Drive Array) controller, ALR duplexed two Adaptec AHA-1740 EISA bus-mastering SCSI disk controllers, each hooked to two Maxtor LXT-535S4 12-millisecond SCSI hard disks. This combination offers mirroring, duplexing, and striping, but the PowerPro supports these functions only in software—not in hardware, as does the Compaq IDA. And while each Adaptec disk controller can handle as many as eight hard disks, the system itself can accommodate only four 3.5-inch hard disks on the swing-out drive door. You can, however, install four more hard disks inside the case.

Since the PowerPro is designed to be Systempro-compatible, it should run any software specifically designed for the Systempro without modification. True to form, a Systempro-specific version of SCO MPX 2.0 loaded on the PowerPro worked without a hitch.

PERFORMANCE

As a file server, the PowerPro's performance paralleled that of the Systempro for the most part, and several factors even gave it an edge: a slightly faster 50-MHz 486 processor versus the Systempro's 33-MHz 486, an extra megabyte of memory (in the tested configuration), and its duplexed SCSI drive controllers.

While executing 1MB files under the NetBench test, the performance curve for both machines dropped sharply at nearly the same point: about 50 workstations for the PowerPro and 48 workstations for the Systempro. Past that point, performance in both machines deteriorated rapidly.

When running the Multiprocessor Database test, both the PowerPro and Systempro exhibited the same multiprocessor bottleneck. The problem arises from the design of the CPU memory bus in the Systempro architecture (which ALR faithfully cloned). When both processors are making many simultaneous requests to main memory, the contention created on the bus slows the system. The PowerPro and the Systempro were about half as fast as the Acer and Digital systems.

While our testing was stressful enough to reveal this problem, it's unlikely that most applications will stress the bus in this fashion. Indeed, adding a second processor should be beneficial. While this test points out the weak link in the Systempro's architecture, this design does not seem to be a problem for those people running in a NetWare environment.

SERVICEABILITY

We found the PowerPro's serviceability to be a little less convenient than with other systems. While two thumbscrews let you remove the side panel easily, the swing-out drive door is more difficult to put back in place: Be careful to align the captured thumbscrews with their respective holes.

Getting to other parts of the system is another problem. The processor slots are located in the middle of the expansion bus, with five EISA slots below them and three above. Their placement—plus the processor connector, which consists of a standard ISA connector at the back of the board and an MCA-style connector near the front of the board—makes it nearly impossible to install processor boards, especially if expansion boards are already

installed in the slots above or below them. We had to be very careful with the SCSI cables for the drive's hard disks on the door when buttoning up the system to be sure that we didn't pinch them between the door and expansion boards. To ALR's credit, you can easily access the three drive bays at the unit's top (two half-height and one full-height), and the standard 300-watt AT-style power supply can also be easily replaced.

The ALR PowerPro SMP 512 486/50 is an interesting mix of off-the-shelf components and super server-style hardware. Its price, design, and configuration bridge the gap between standard tower systems and true super servers.

COMPAQ COMPUTER CORP.

Compaq Systempro
486-2040

The Compaq Systempro, launched in 1990, was such a technological tour de force that *PC Magazine* gave it an Award for Technical Excellence that fall. With two 486/33 processors, an EISA I/O bus that accommodated multiple I/O bus masters, and Compaq's IDA (Intelligent Drive Array) controller, the Systempro brought mainframe technology to the PC level.

Since then, other vendors have tried to equal the Systempro in their designs and marketing efforts—among them the ALR PowerPro SMP 512 486/50, also reviewed here. Now there may be other machines with higher peak throughput or greater scalability, but Compaq still makes a solid, reliable super server; the latest in this line is the Compaq Systempro 486-2040.

ARCHITECTURE

The Systempro uses the Flex MP bus for its CPU and an EISA bus for I/O operations. The motherboard has 11 slots: 7 EISA (5 bus-mastering and 2 non-bus-mastering), 2 memory, 1 memory or processor slot, and 1 primary processor slot. Our test unit had 48MB of RAM, and the system can support 256MB.

The \$51,272 price of our test system was based on a system with two 486/33 processors, each with 512K of second-level write-through cache, 48MB of system memory, one IDA controller with eight 510MB hard disk pairs (about 4.1GB of internal disk storage), built-in VGA circuitry with blitter (bit-block transfers



ALR PowerPro SMP 512 486/50
Advanced Logic Research Inc., 9401
Jeronimo Dr., Irvine, CA 92718; 800-444-
4257, 714-581-6770; fax 714-581-9240.
List price (tested configuration): \$32,552.
Configuration: Two 486/50 processors,
49MB RAM with 512K read- and write-back
cache, four 535MB Maxtor SCSI hard disks,
one 1.2MB and one 1.44MB Mitsubishi floppy
disk drive, two Adaptec 1740A 32-bit EISA
SCSI controllers, two Novell NE3200 Ethernet
NICs, two Madge EISA 16/4 Smart Token-
Ring Ringnode NICs, 300-watt power supply.

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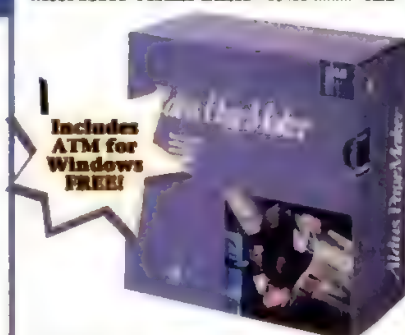
Freelance Graphics 4.0 #09528 **\$228**

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Lotus 1-2-3 V.2.4 • #09476 - 5.25" disk • #09477 - 3.5" disk **\$34**



Aldus PageMaker 4.0 **\$488**

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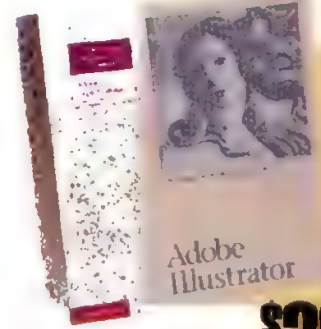
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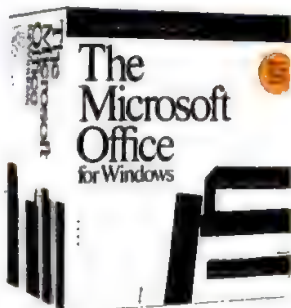
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Microsoft Office 2.5 for Windows \$484

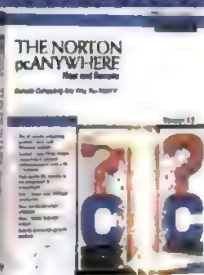
Microsoft Office provides complete office automation! Comes with four essential business productivity applications—word processing, spread-sheet, desktop presentations and electronic mail—all combined in one package. Each module is an industry standard in its category. New version 2.5 includes the newly-released MS Word Version 2.0! Microsoft Corp. • #10563 - 5.25" disk • #10564 - 3.5" disk

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TypeReader eliminates the costly and time-consuming process of re-typing! With TypeReader OCR software and your scanner, you can quickly, easily and accurately convert the printed page into electronic format. Any printed page can be converted into most popular word processing, spreadsheet, database and page layout formats. Fast, easy and accurate. ExperVision • #07718 - 5.25" disk • #07719 for 3.5" disk



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New V.4.5 Norton pcANYWHERE allows you to take control of another PC running under DOS or Windows via serial or modem connection, and perform background file transfer and general communications. Symantec • #07652 - 5.25" disk • #07653 - 3.5" disk



Crosstalk for Windows 1.2 \$122

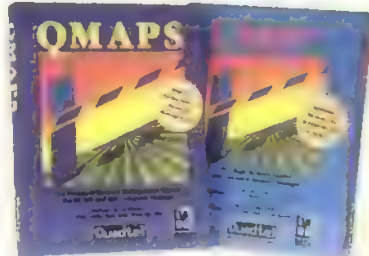
The engineering excellence of Crosstalk is available to the Windows user in a full-featured, asynchronous communications package designed specifically for Windows. It's easy to master, supports DDE, features an easy script language and offers excellent background operation. Info Product of Year 1991. Crosstalk #07385

Crosstalk Communicator #09042\$34



Procomm Plus 2.01 \$68

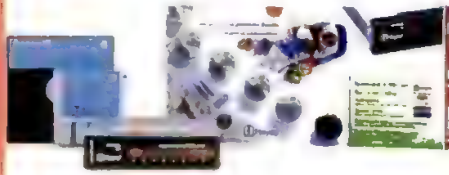
A powerful, easy-to-use communications software package, ProComm Plus 2.01 includes: 33 popular terminal emulations with keyboard remapping, 15 error correcting file transfer protocols, advanced host mode for unattended remote access with electronic mail, file transfers and fully automated dialing directory. Datastorm #09149



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Graphics Vantage 1Mb VGA #07187\$324
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3FGX Monitor 15" #07144\$798
5FG Monitor 17" #07399\$1498
6FG Monitor 21" #07182\$3048



in hardware), a keyboard, two Novell NE3200 Ethernet adapters, two Proteon 1990 dual-speed Token-Ring network interface cards, and a 300-watt power supply.

The Systempro is designed to give reliable, predictable performance for mission-critical applications. At the core of Compaq's ability to deliver is its IDA (Intelligent Drive Array) controller. The IDA ensures a high degree of data reliability. It has the ability to stripe across hard disks, mirror, or guard the data—all in hardware; you can also add a second IDA if you prefer to duplex the data. Compaq also offers an optional administrator notification system that can call or page a preset number in case the system malfunctions. But the company stops short of having an internal UPS or ECC (error-correction code) memory. If you truly need these extra measures of reliability, you will have to look elsewhere.

PERFORMANCE

The IDA is the key to the Systempro's performance. On ZD Labs' *NetWare* 3.11 Throughput test with a 1MB file, the Systempro achieved the highest peak throughput of all the EISA-bus disk systems; it was neck-and-neck with the ALR PowerPro. Also, this system was second only to the Tricord PowerFrame 40/33C in overall peak throughput. (While the PowerFrame has an EISA bus, its disk system interfaces through an intelligent high-speed I/O channel). Eight hard disks bolstered by the efficiency of the IDA were responsible for such high peak throughput.

The Systempro maintained its scalability—its ability to service increasing numbers of users—through 48 users on the 1MB-file NetBench test and through 72 users on the 512K-file test. Beyond those points, the throughput fell off sharply. Of course, none of the EISA-bus machines were able to scale as well as the significantly more expensive NetFrame and Tricord servers, which have proprietary I/O systems.

On our Multiprocessor Database test, under SCO with MPX, the Systempro's throughput did not increase when we added a second processor. The reason, according to Compaq, is that the Systempro becomes memory-bound: If both processors are simultaneously making heavy use of system memory, enough contention is created on the Systempro's CPU-memory bus to slow the system. Compaq is in-

COMPUTERS SUPER SERVERS



Compaq Systempro 486-2040

Compaq Computer Corp., 20555 State Hwy. 249, Houston, TX 77070; 800-231-0900, 713-370-0670.

List price (tested configuration): \$51,272.

Configuration: Two 486/33 processors, 48MB RAM with 512K write-through cache, eight 510MB Compaq IDE hard disk pairs, one 1.2MB and one 1.44MB Canon floppy disk drive, one Compaq Intelligent Drive Array controller with a 256K seek- and read-ahead cache and a 128K buffer, two Novell EISA NE3200 Ethernet NICs, two Compaq EISA Dual Speed Token Ring Controllers, 355-watt power supply.

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corporating design fixes to solve this problem in the next version of the Systempro. (ALR's faithful Systempro clone, the PowerPro, suffers the same performance anomaly.)

Keep in mind that this test was very stressful to the CPU memory bus and did not involve any I/O to the hard disk subsystem. Few applications will stress the bus this much, and most will benefit upon the addition of a second processor. While this test points out a weak link in the Systempro's architecture, this problem does not seem to occur under *NetWare*.

SERVICEABILITY

The Systempro's serviceability is almost as good as it gets with most super servers. Six thumbscrews release the one-piece chassis cover. Inside, near the top of the unit, there is a single third-height bay and two half-height bays for floppy disk drives and an optional tape backup drive. Near the bottom, you will find eight 3.5-inch drive bays for the internal drive array. The 300-watt power supply is at the top of the unit, where we believe it belongs. (Ever drop a screw in a tower system where the power supply was at the bottom?)

Only two minor drawbacks mar the serviceability of the Systempro. The first, which applies to every EISA bus machine, is that the EISA bus connector's stiffness makes it difficult to install or remove boards. Second, the interface cables for the disk array are very sensitive and don't like to be jostled, though a metal plate keeps the cables steady. It's difficult to replace the cables and the cover, however, if you do remove them.

Compaq claims to have about 70 per-

cent of the super server market, so it seems that the problem with the CPU memory bus has not had much impact on this PC's sales. Database servers, after all, represent a very small part of the market. The Compaq Systempro 486-2040 has a mixture of price, performance, serviceability, and scalability that people find desirable in a file server.

DIGITAL EQUIPMENT CORP. applicationDEC 433MP

Digital Equipment Corp. does not recommend its \$39,603 applicationDEC 433MP tower system for *NetWare*. Instead, this Corollary-bus (C-bus) system's excellent processor scalability makes it a fine server for mission-critical, multiprocessing Unix applications.

The applicationDEC tested by ZD Labs came with two 33-MHz 486 processors (each with 256K of write-back cache), 48MB of RAM, and an Adaptec 1740B bus-mastering SCSI disk controller connected to five SCSI hard disks with a total capacity of 2.1GB. The configuration also included a CD-ROM drive, a 525MB tape backup drive, 1.2MB and 1.44MB floppy disk drives, and an ATI VGA Wonder video card—items we did not specifically request. The price did not include the two eight-bit IBM Token-Ring and two 16-bit Western Digital Ethernet network interface cards Digital included, since the company does not sell those cards; adding them would increase the price by about \$1,500. Digital also recommends Standard Microsystems Corp.'s Ether Card Plus Elite 16T for \$279 per card.



applicationDEC 433MP

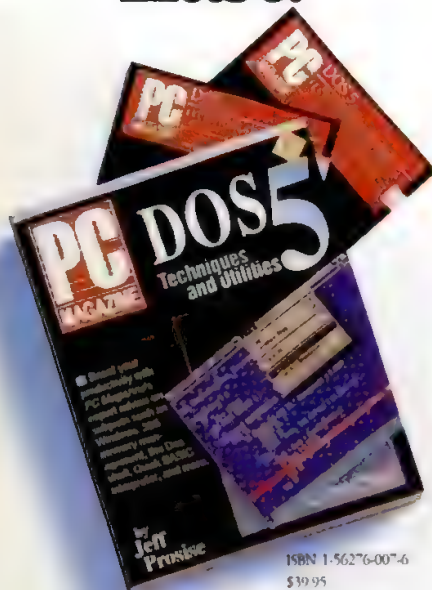
Digital Equipment Corp., 4 Results Way, Marlboro, MA 01752; 508-467-5111; fax 508-467-1508.

List price (tested configuration): \$39,603.

Configuration: Two 486/33 processors, 48MB RAM with 256K write-back cache, five 426MB Digital EISA SCSI hard disks, one Adaptec 1740B EISA SCSI disk controller, ATI VGA Wonder display card, CD-ROM drive, 525MB tape backup drive, one 1.2MB and one 1.44MB TEAC floppy disk drive.

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ISBN 1-56276-007-6
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1-800-688-0448



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Emeryville, CA 94608

COMPUTERS SUPER SERVERS

ARCHITECTURE

Designed around the C-bus architecture, this system can support as many as four processors. The C-bus, an architecture developed and licensed by Corollary, is a 32-bit-wide system bus (not an I/O bus) that allows data-transfer rates of up to 64MB per second. Four of the nine slots on this bus support processors, four take memory cards, and one holds a parallel/serial interface board with a real-time clock.

The only drawback to the applicationDEC's design is its 64MB memory limitation: The four C-bus slots hold memory cards that use 1MB rather than 4MB SIMMs. The reviewed servers from Acer, Compaq, and Tricord support at least double that amount, though those from ALR and NetFrame support 49MB and 64MB, respectively.

The applicationDEC also uses a standard EISA I/O bus. With five bus-mastering and two non-bus-mastering EISA I/O expansion slots, and support for disk array software, this unit would make a perfectly acceptable *NetWare* server if Digital chose to market the system in that way.

The system can handle as many as nine storage devices and will support RAID disk array software. Like Digital's larger VAX systems, the applicationDEC uses ECC (error-correction code) memory. By employing these two fault-tolerance mechanisms, the applicationDEC ensures the stability of the system's operation and maintains the disk array's data integrity.

PERFORMANCE

ZD Labs did not test the applicationDEC as a file server, since Digital does not recommend this system for use with *NetWare*, and testing it with other network operating systems would show performance that couldn't be compared with that of the other reviewed super servers.

As a multiprocessor database server, the applicationDEC write-back cache design, 64MB-per-second C-bus transfer rate, and cache coherency schemes helped this system turn in the best scalability on ZD Labs' multiprocessor database test.

The single-processor applicationDEC did not score as well as the single-processor AcerFrame 3000 MP33 (13.2 compared with 16.7 transactions per second). But adding a second processor boosted

the applicationDEC's throughput by 47 percent to 19.5 transactions per second (compared with the AcerFrame's 14 percent increase to 19.1). This was the highest performance score and the greatest performance improvement shown when adding a second processor.

Because the C-bus design permits CPUs' caches to communicate, adding more processors effectively adds more cache memory to each CPU and reduces contention on the system bus. Additionally, the write-back cache scheme is more effective than write-through cache in reducing system-bus traffic. The result: More CPUs means better performance.

SERVICEABILITY

The applicationDEC 433MP was designed for easy servicing. You just loosen the thumbscrews on the back of the case and the one-piece case cover slides off. Once you remove the cover, you can easily reach all the components. The I/O backplane is on the left side, and mass-storage devices run along the top and right sides. For the processor, memory, and expansion boards, screws that secure the card bracket to the case are captured on the card brackets themselves, instead of falling into the case's crevices.

We did find two areas that needed improvement, however. Both the C-bus and EISA-bus boards were difficult to remove and replace. In addition, Digital used non-steerable wheels, not casters, making it difficult to move the unit.

Though the C-bus is moving toward the mainstream (with companies such as ALR and American Mitac offering systems based on the C-bus), Digital has done a marvelous job of adding value to the core system.

NETFRAME SYSTEMS INC.

NetFrame NF400 Network Mainframe

The NetFrame NF400 Network Mainframe approaches mainframe status in architecture, performance, and price. As tested, this \$98,370 super server came configured with everything necessary to get the maximum I/O performance possible in a file server.

The price includes one Intel 486/25 microprocessor with 32K of copy-back cache, 48MB of ECC (error-correction code) memory, and 16 200MB SCSI-2

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PC Magazine, Oct. 29, 1991

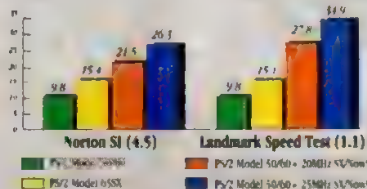
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COMPUTERS SUPER SERVERS

hard disks totaling 3.2GB of storage. Our tested configuration also came with two Ethernet and two Token-Ring network connections and two power supplies.

ARCHITECTURE

The NetFrame is modeled after high-end mainframe computers. As many as eight I/O processor or application processor (AP) boards can be installed on this system's motherboard, and each processor board is dedicated to specific tasks. The system ZD Labs received came with four of NetFrame Systems' proprietary I/O processor (IOP) boards. Two of these boards contained Token-Ring network and SCSI-2 disk controllers, and two held Ethernet network and SCSI-2 controllers. Each controller managed 4 of the 16 hard disks.

The NetFrame's structure, which the company calls the Multiprocessing Server Architecture (MPSA), is highly fault-tolerant and can sustain high performance levels with heavy user loads. The MPSA's main 64-bit system bus, which operates at 100 megabytes per second, permits each board to have a separate path directly to the CPU and main memory with essentially no contention.

A dedicated maintenance processor, redundant power supplies, mirrored disk I/O, ECC memory, bus parity checking, remote console support, and administrator notification of system problems all make the NetFrame vault-like in terms of keeping your data safe.

This proprietary architecture, which is asymmetrical by definition and is used in all NetFrame systems, provides one key item: future product-line growth. This scheme allows designers to increase the speed and size of the main CPU bus without losing compatibility with existing IOP and AP boards.

NetFrame currently supports only two network operating systems, *NetWare*, Version 3.11, and *OS/2 LAN Manager* 2.1; there is no SCO MPX support for this system. Since each NetFrame is customized for the customer's needs, it is usually shipped fully configured with hardware and software.

NetFrame's administration software, which runs under Windows, is required if you need to reinstall the network operating system on the server. The hardware and software are designed for remote server administration; the server itself has neither a direct screen console nor a keyboard. ZD Labs quickly became fa-

miliar with the software, and that this design makes the administration of more than one server fairly easy.

PERFORMANCE

We expected the NetFrame, with its MPSA specifically designed for intense I/O loads, to scale quite well as a file server; it did. The system showed no significant decrease in throughput when ZD Labs tested the system with 8, 16, 24, 48, 72, and 96 clients. Only the Tricord PowerFrame 40/33C showed comparable I/O scalability. We also thought the NetFrame would have one of the highest peak throughputs of all the systems tested. Here, though, we were wrong: The ALR PowerPro SMP 512 486/50, Compaq Systempro 486-2040, and Tricord PowerFrame 40/33C achieved higher peak throughput. We attribute this performance to two main factors. First, the NetFrame came with a 25-MHz 486 CPU, while the five other machines in this roundup came with either 33- or 50-MHz CPUs. Second, the NetFrame had only 32K of external processor RAM cache, compared with at least 128K on the others.

Because the NetFrame contains only one main CPU (other processors control other functions) and does not support SCO MPX, we skipped the multiprocessor database tests.

When ZD Labs tested this system, NetFrame was not yet shipping its NF450FT. The NF450FT, which was

scheduled to ship in mid-April, addresses the only two shortcomings ZD Labs found in the NF400: It employs a 50-MHz 486 CPU and 256K of processor RAM cache. As further improvements, the NF450FT has a higher RAM capacity (256MB, compared with the NF400's 64MB) and additional fault-tolerance features, such as hard disk hot-swapping capabilities.

(Hot swapping refers to the ability to repair a component without shutting down the entire system.)

On the hardware level,

the NetFrame employs

parity checking on

all data pathways

and in memory.

SERVICEABILITY

The NetFrame is a highly serviceable machine. The front doors swing out to reveal the drive bays, connectors, and removable processor modules, making it easy to swap

out a failed item. The machine is also on casters—a necessity for a heavy system such as this.

The only real layout problem is in the wires' exit path: The AC power cord, network cables, and external connectors all run out through the bottom of the machine. It sounds aesthetically pleasing, but these wires got in our way.

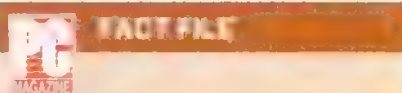
The most important issue about the NetFrame is reliability. From the hardware design level to the final shipping, every effort is made to ensure the machine works when it arrives and will continue working.

On the hardware level, the system employs parity checking on all data pathways and in memory. The hard disks are constantly checked for errors and failures, and they can be hot fixed by an enhanced *NetWare* driver.

The NetFrame comes with two power supplies so the system can run if one fails. Cooling fans sense the temperature to determine how fast they should run in order to dissipate the heat. The NetFrame can also send failure notices over dial-up with a digitized voice, paging systems, and RS-232 connections. (Like the AcerFrame, the NetFrame has an LCD panel that lets you monitor basic system functions.)

After assembly and before it is shipped, the system undergoes an intense burn-in period of several days. During this period, the NetFrame is exposed to varying temperatures to ensure stability.

As the Mercedes-Benz of file servers,



NetFrame NF400 Network Mainframe

NetFrame Systems Inc., 1545 Barber Ln., Milpitas, CA 95035; 800-852-3726, 408-944-0600; fax 408-434-4100.

List price (tested configuration): \$98,370.
Configuration: One 486/25 processor, 48MB RAM with 32K write-back cache, 16 200MB Maxtor SCSI-2 hard disks, two NetFrame SCSI-2 controllers with Token-Ring network circuitry, two NetFrame SCSI-2 controllers with Ethernet network circuitry.

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COMPUTERS SUPER SERVERS

the NetFrame is one of the few choices for a single departmental server system. While not quite on a par with the PowerFrame in terms of peak performance, the NetFrame NF400 Network Mainframe can add users without breaking a sweat. That scalability is the most important factor when considering a super server.

TRICORD SYSTEMS INC.

Tricord PowerFrame 40/33C

The Tricord PowerFrame 40/33C was the best-performing super server of the six reviewed here. Its superior I/O scalability under *NetWare*, Version 3.11, gives this system the ability to support a large number of users better than any other in this review.

The \$70,385 PowerFrame came with a single 486/33 processor board with 256K processor RAM cache, two boards that controlled an array of 12 329MB hard disks (a total of 3.9GB), a Paradise VGA card, two Proteon 1990 Token-Ring network interface cards, two No-

vell NE3200 Ethernet adapters, and two floppy disk drives.

ARCHITECTURE

The PowerFrame is a balanced mix of proprietary and industry-standard technology; the machine can handle an increasing load in a linear fashion, yet it keeps an open system architecture.

Like other systems in this review, the PowerFrame uses two buses. The PowerBus is a proprietary 32-bit system bus functioning at 132MB per second, and it provides a high bandwidth path for use by the CPUs, memory, and proprietary Intelligent I/O Processors (IIOPs), which control the hard disk subsystem.

The I/O bus, however, is EISA and can accept any standard network interface cards or any other EISA or ISA card. A single 8-bit ISA slot is generally allocated for video use.

The IIOPs are the most important aspect of the PowerFrame's design. These boards provide the system with superior I/O scalability by giving the disk array direct, high-speed access to the memory

and CPU, avoiding EISA bus intervention. Each IIOP contains an Intel 386 processor and two SCSI-2 buses. The cards' increased intelligence allows the main CPU to initiate disk transactions while the IIOP takes care of moving the data.

As soon as information was made available from the disk array, it could be moved without delay across the high-bandwidth PowerBus. The 486 CPU could initiate multiple transactions, with the 386s on the IIOPs taking care of the rest. The cache on the IIOPs also increased the speed of transactions over the SCSI bus. No matter how many write requests were generated by ZD Labs' NetBench test, the disk subsystem serviced the calls rapidly enough for the system to operate smoothly.

PERFORMANCE

We ran only ZD Labs' NetBench test on the PowerFrame. As a file server, the PowerFrame was first at both combined peak I/O throughput and I/O scalability. Under NetBench, the PowerFrame sustained its high level of throughput as we increased the number of client users. In

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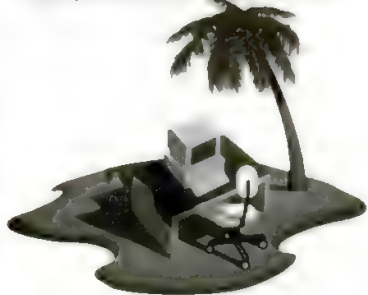
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fact, in all cases the PowerFrame showed higher NetBench throughput than any other system serving 48 or more clients. Knowing the fairly stressful file I/O nature of NetBench, we believe the PowerFrame could handle more than 200 users without a problem.

The PowerFrame's high peak throughput is partly due to its 33-MHz 486 processor, which allowed it to control more transactions at a faster rate than the NetFrame NF400 Network Mainframe's 25-MHz 486. The disk array and the machine's basic architecture (with disk control on the PowerBus instead of the EISA bus), however, contributed to the system's ability to handle more clients than the other systems in this review.

Having disk controllers with direct access to the main system bus is arguably the most important factor in making a system with superior I/O scalability. That access, coupled with the large number of hard disks, allowed the PowerFrame to handle multiple, simultaneous reads from and writes to the hard disk subsystem without a sudden break in performance. The NetFrame, with similar direct pathways between the disk and the main system bus, parallels the PowerFrame's scaling performance.

While the PowerFrame supports a wide range of network operating systems, including SCO MPX 1.0, ZD Labs was unable to run the multiprocessor data-

base test on the PowerFrame because Tricord's proprietary SCO MPX 2.0 was not available until mid-April, after our testing deadline. New releases of MPX for the PowerFrame generally lag behind those available for other platforms.

SERVICEABILITY

The PowerFrame is a very serviceable machine that vaguely resembles a low-boy refrigerator. You must first swing open the front panel, as you would a refrigerator door, to gain access to the system. This reveals the floppy disk drives, hard disks, tape drive, reset switch, DC power switch, and key lock. (There is also an AC power switch on the lower back panel.) After loosening two screws along the top of the unit, you can raise the lid of the machine like the hatchback of an automobile. (A pneumatic arm makes this procedure even easier.) The EISA and PowerBus connectors are easy to reach, so installing and removing cards and memory is a painless process. A switch on the lid powers down the machine once you open the lid. The heavy unit is also on casters, allowing you to move it easily.

Getting to the drive area and the power supply takes a little more work. Behind the front panel, a row of eight screws along the left side holds the side door shut. The drive mounts and system power supplies reside behind this door. In our fully loaded system, access was tight but not impossible. The internal framing of the cabinet interfered with access to the drives and power supplies.

With features such as memory parity checking, support for RAID-5, dual SCSI paths on the IIOP, dual power supplies and temperature sensing, the Tricord PowerFrame 40/33C makes a reliable single platform for all large-network needs. And with the performance numbers to back it up, this super server is definitely worth the price. ■

David Greenfield is an associate editor of PC Magazine. Robert W. Kane is the benchmark manager of ZD Labs. David J. Frerichs is the network systems integrator of ZD Labs.

*The Tricord's EISA
and PowerBus
connectors are easy
to reach, so
installing and
removing cards and
memory is painless.*



Tricord PowerFrame 40/33C

Tricord Systems Inc., 3750 Annapolis Ln., Plymouth, MN 55447; 800-874-2673, 612-557-9005; fax 612-557-8403.

List price (tested configuration): \$70,385.

Configuration: One 486/33 processor, 48MB RAM with 256K write-through cache, 12 329MB Fujitsu M2622S hard disks, one 1.2MB and one 1.44MB TEAC floppy disk drive, two Tricord intelligent I/O Processor SCSI controllers, two Novell NE3200 Ethernet NICs, two Proteon 1990 Token-Ring NICs, Paradise VGA Plus VGA display card.

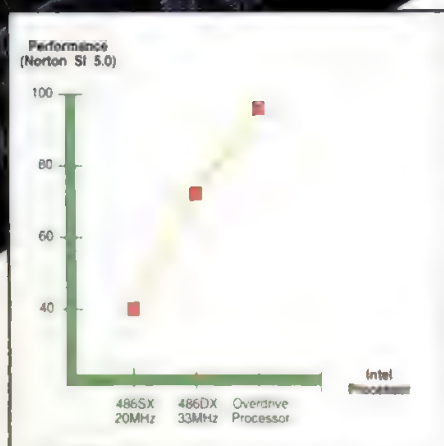
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Processor Socket ■ 64KB cache with 256KB cache option ■ 1.2/1.44

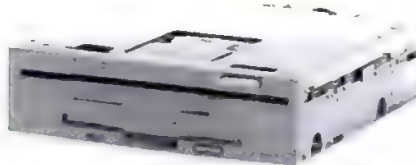
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April 1991
Crosstalk Mk. 4



April 30, 1991
Crosstalk Mk. 4 Version 2.0



Vol. 7 No. 12 1990
Crosstalk Mk. 4

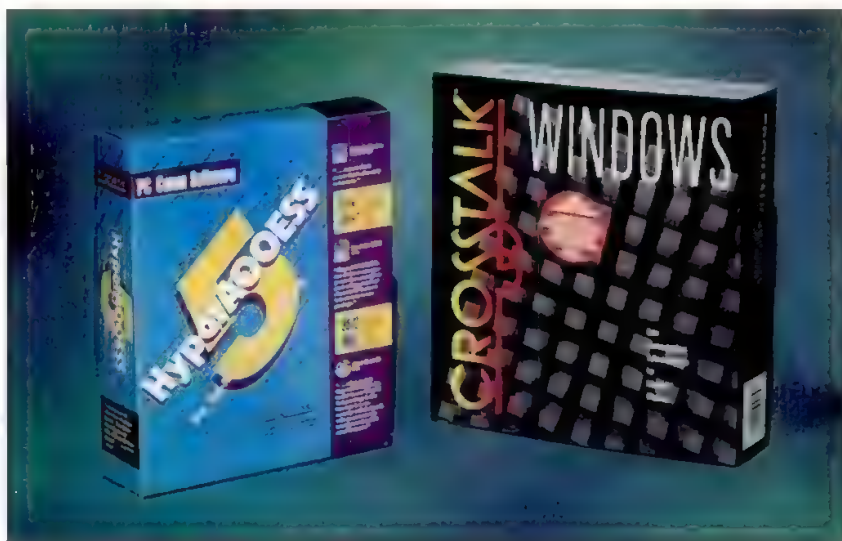


MODEM COMMUNICATIONS SOFTWARE Too Hard to Use?

IN THIS REVIEW

- U.S. Robotics
BLAST Professional
- SupportWare
COM-AND
- Digital Communications Associates
Crosstalk for Windows
Crosstalk Mk.4
Crosstalk Communicator
Crosstalk XVI
- FutureSoft Inc.
Dynacomm Asynchronous for Windows
Terminal Plus
- Hilgraeve Inc.
HyperAccess/5
- Software Ventures Corp.
Microphone II for Windows
- SoftKlone Distributing Corp.
Mirror III
- MagicSoft Inc.
MTEZ
- PereLine Data Systems Inc.
PereLine
- Lead Technologies Inc.
Pilot
- Datastorm Technologies Inc.
Procomm Plus
- Omen Technology Inc.
Professional YAM
- Mustang Software Inc.
Qmodem
- Microcom Inc.
Relay Gold for DOS
Relay Gold for Windows
Microcourier
- Quercus Systems
Rexxterm
- Hayes Microcomputer Products Inc.
Smartcom Exec
Smartcom III
- White River Software
Telemate
- Exis Inc.
Telix
- Data Graphics
Unicom

Choosing the right communications software for your modem can be a tough task. And so is using it. PC Magazine Labs tested 26 comm packages to find out which one is the best at sending and receiving data as fast as the highest-speed modems can deliver it.



by Frank J. Derfler, Jr.

It shouldn't be this hard. Hayes delivered its first modem years before IBM shipped the first PC. Yet even though more than a decade has passed, you still stand only a mediocre chance of successfully transferring a file between two PCs on the first try.

The latest crop of general-purpose communications packages offers the latest in scripting, protocol support, and

performance, but none offers flawless modem compatibility. Unless you've got a modem directly supported by the software, beware.

The 26 packages we looked at have a lot in common. All offer pull-down menus, dialing directories, and a variety of file-transfer protocols. And except when you use a proprietary protocol, or when a Zmodem transfer is interrupted, performance on all of these packages is about the same.

Some packages will cost you several hundred dollars; others run a mere \$50. Make no mistake, though. With the lower price tag come trade-offs in performance, protocol support, and scripting.

REVIEW CRITERIA

For this review we required that all of the products take advantage of the data buffering offered in the 16550AFN Universal Asynchronous Receiver/Transmitter (UART), support Xmodem and Ymodem file-transfer protocols, offer scripting, and supply ANSI and VT-100 terminal emulations. Most also support Zmodem file-transfer protocols.

The 16550AFN UART support was the most critical factor. A chip inside the PC that converts between the computer's parallel data stream and the modem's serial data stream, this UART lets products transmit data at 57.6 kilobits per second. Many top-end PCs now come with the 16550AFN installed (see the sidebar "Meeting of Minds: Modems and the PC's UART," in the "Maximum Modems: 14,400 bps and Rising" feature, *PC Magazine*, March 17, 1992).

Since Microsoft Windows 3.0 does not support the 16550AFN, the Windows packages did not have to meet this criterion. A new driver for Windows 3.1 enables higher-speed communications, but most packages that take advantage of these enhanced capabilities weren't ready in time for our review. There were two exceptions, Software Ventures' *Microphone II for Windows*, Version 2.0, and Data Graphics' *Unicom*, Version 3.0. Consequently, all of the packages were tested under Windows 3.1, with most sustaining

only a 19.2-Kbps connection (see the sidebar "Communications, Windows Style: A New Driver, a New Procomm").

Most of the packages reviewed here let

you access ASCII-based information services, such as CompuServe, MCI Mail, Dialog, and Dow Jones News/Retrieval, local BBSs, and remote PCs. If you need to access only a single on-line service, specialized applications like *TAP-CIS*, *AutoSIG*, and *CISNAV* for CompuServe, the Pro-

duigy access software, and the America OnLine access software are available.

Odyssey, from the Software Co-op, and *Boyan*, from Boyan Communications, are not reviewed here because they do not support 57,600-bit-per-second connections. Multi-Tech's *MultiExpress* was not ready in time for testing.

One product that arrived too late for testing was the \$15 shareware program, *Cedar Island Link*, from Cedar Island Software. The program is available for downloading from Library 11 in PC MagNet's Utilities/Tips Forum (GO ZNT:TIPS) under the filename CILINK.ZIP. In the same library, you will find the other shareware programs that are reviewed in this feature.

CONTROLLING THE DATA FLOW

Communications programs essentially turn your PC into a terminal. Every character you type is sent to the remote host; in turn, the host's response is sent back and displayed on your PC.

Part of the job of adequately supporting a high-speed connection is controlling the flow of data into and out of the modem. Before 9.6-Kbps modems, computers could overrun the modem's buffer. Now the opposite is true. Modems can now receive data faster than the UART can handle it.

Communications packages typically rely on two techniques for controlling transmission: software and hardware flow control. Software flow control embeds special characters, called XON and XOFF, within the data stream to signal the

HIGHLIGHTS

■ Despite improvements, communications software packages are not easy to use. They require too much setup time, and too many things can go wrong, especially with newer modems. Your best bet is to choose a package that directly supports your modem; this way installation should be straightforward.

■ Reviewed here are 26 communications programs. All of the applications support the 16550AFN UART, Xmodem, Ymodem, and Zmodem file-transfer protocols, offer scripting, and supply ANSI and VT-100 terminal emulations.

■ Most DOS-based packages show similar file-transfer speeds when running standard protocols uninterrupted. Performance of proprietary protocols can vary greatly, however. *HyperAccess/5's* HyperProtocol produced the best scores among proprietary protocols, while *Professional YAM's* Zmodem-90 outdid its competitors in raw Zmodem speeds.

■ Windows packages are slower. Only *Unicom* and *Microphone II* take advantage of the new Windows 3.1 communications driver, COMM.DRV.

■ Only eight programs fully support Zmodem-90 features like data compression, crash recovery, and date code overwrite protection.

■ Scripting capabilities vary between products. *Crosstalk Mk.4*, *Procomm Plus*, *HyperAccess/5*, *Smartcom III*, and *Professional YAM* all offer powerful scripting capabilities. *Crosstalk Mk.4* and *XVI*, *HyperAccess/5*, *Smartcom III*, *Procomm Plus*, and others provide a learn feature to create a script automatically.

modem to pause transmission. Flow control schemes, however, can be fooled by binary characters already in the data stream.

Hardware flow control corrects this problem. Instead of embedding characters, PCs and modems change the voltage levels on certain RS-232 wires to signal the pause and start of transmission.

NETWORK-READY

There were a couple of areas where products differentiated themselves. One was in networking support. In today's corporate environment, modems may not always be attached directly to your PC; they may be located on the network. About 10 out of the 26 packages reviewed in this roundup allow you to share these modems on a communications server.

There are two major techniques for supporting networked modems: interrupt (INT) 14 or NASI (Network Asynchronous Services Interface). An application can address either the software interrupt 14h favored by Microsoft and IBM, or NASI, introduced by Novell. Both techniques redirect serial communications across the network.

TERMINAL EMULATION

Another area that separated the communications packages was terminal emulation. Since mainframe and minicomputer systems typically expect to communicate with special-purpose terminals, they make certain assumptions about the terminal hardware. For example, they may control the position of the cursor and the display of the characters on the terminal screen through special codes transmitted in the serial data stream.

How well a PC can respond to these codes varies widely. All of the applications in our review offer some terminal emulation. The typical set includes American National Standards Institute (ANSI) and Digital Equipment Corp.'s VT-100 and VT-220 series of terminals.

PROTOCOL TRANSFER

File-transfer protocol support is one of the most critical distinctions among these products. A file-transfer protocol moves files between communications programs in blocks while controlling errors introduced in the communications stream and perhaps using data compression. Common protocols for this purpose include Kermit, Xmodem, Ymodem, and Zmodem. Some information services provide their own file-transfer protocols, such as CompuServe B (see the sidebar "The XYZs of File Transfer").

While implementations differ, all of the packages reviewed here offer Xmodem and Ymodem; most support Zmodem. Only eight vendors support the more obscure features of these protocols. Zmodem, for example, includes a date-coding feature to prevent older files from

THE XYZs OF FILE TRANSFER

by M. David Stone

Few things in communications are as potentially confusing as file-transfer protocols. Not only are there plenty of choices, but the same protocols masquerade under different names, and different vendors use the same name for different protocols. The first rule for file transfer, then, is to make sure you know what you've got on both sides of the link.

For our purposes, the preferred definitions are descriptive. Xmodem, for example, is best used as a generic term, while any specific implementation is referred to as Xmodem-CRC, Xmodem-checksum, or Xmodem-CRC with a fallback to checksum. With that ground rule in mind, here's a look at the most widespread protocols you'll encounter:

ASCII file transfer isn't really a file-transfer protocol. There is no coordination between sending and receiving systems, no error control, and no ability to transfer binary files. The send feature is useful for sending a text file to an on-line system as an alternative to typing a message while you're on-line. The receive feature is useful for capturing all or part of an on-line session to disk. Don't use it for file transfer.

Xmodem-checksum is the one protocol you're sure to find in almost any communications program on the market. Checksum error checking has less overhead than the more sophisticated cyclic redundancy check (CRC) method and is slightly faster than Xmodem-CRC. However, Xmodem-CRC will find errors that checksum will miss.

Xmodem-1K (Ymodem in some programs) is similar to classic Xmodem, except that it sends data in 1K blocks instead of 128-byte blocks. The larger block size means less overhead for error-control information. But if the protocol detects an error, there's more data to resend. If you have a good connection on your line, Xmodem-1K will be faster than Xmodem. If you have a poor connection, you may find

that Xmodem will be faster.

Ymodem batch (Ymodem in some programs) is similar to Xmodem-1K, with the same advantages, except that it also lets you use DOS wildcard characters to designate groups of files to send. If both are available, use Ymodem batch when you have more than one file to transfer.

Both Xmodem-1K-G (sometimes called Ymodem-G) and Ymodem-G batch (also occasionally referred to as Ymodem-G) are designed to work with modems that have built-in error control. These are streaming protocols, meaning that the sending side doesn't wait for an acknowledgement that a data block was received correctly. The receiving side simply aborts the transfer if it detects an error. If you've established an error-control link (with an MNP4 or V.42 modem, for example), these protocols will yield far faster file transfers than other variants of Xmodem or Ymodem.

Zmodem is another streaming protocol. However, Zmodem doesn't abort the transfer if it detects an error (and it has other advantages as well). Instead, the receiving side asks for a retransmission of garbled data. That makes it a good choice whether or not your modem has established an error-control link.

Omen Technology's *Professional YAM* implements a version of Zmodem called Zmodem-90. Zmodem-90 offers several proprietary enhancements to Zmodem that boost the protocol's performance and reliability and increase the number of environments supported.

Kermit is designed for transfers with minicomputer and mainframe systems that can handle only a 7-bit data length. When sending a binary file, Kermit uses a technique called 8-bit quoting to send the eighth bit separately. However, some versions of Kermit don't support 8-bit quoting, which limits them to transferring text files. Kermit is also relatively slow, so you should use it only when you have no other choice.



EDITORS' CHOICE

- Crosstalk for Windows
- HyperAccess/5

Hilgraeve's \$99.95 *HyperAccess/5* gets our Editors' Choice award in the DOS-based communications software category, while DCA's \$195 *Crosstalk for Windows* earns this distinction among Microsoft Windows-based packages. Both provide a rich set of features, although *HyperAccess/5* gives you greater speed.

HyperAccess/5 performed consistently well on our tests, and Hilgraeve's HyperProtocol outperformed the other proprietary protocols we tested. *Crosstalk for Windows* features a well-designed Windows implementation full of icons that make it intuitive to operate.

Honorable mention in the DOS-based communications category goes to three packages: Datastorm Technology's \$129 *Procomm Plus*, U.S. Robotics' \$169 *BLAST Professional*, and DCA's \$245 *Crosstalk Mk.4*. *Procomm Plus* features a remarkably easy-to-use interface, and a good selection of terminal emulations and protocols. Unlike *HyperAccess/5*, however, it does not include a fast proprietary protocol.

BLAST Professional can communicate with other versions of *BLAST* made for environments such as Unix, Xenix, VMS, and the Macintosh. *Crosstalk Mk.4*, the Editors' Choice winner in our last review of comm programs, also performed well on our tests, but *HyperAccess/5*'s HyperProtocol showed the fastest speed. *Crosstalk Mk.4* does include a powerful multisession capability.

Honorable mention in the Windows category goes to Software Ventures' *Microphone II for Windows*, which supports the new Windows 3.1 COMM driver to give it the best speeds among the Windows programs. *Microphone II* doesn't have as many features as *Crosstalk for Windows*, however.

overwriting newer ones, and it can recover from a line error without retransmitting an entire file. *Professional YAM* implements its own version of Zmodem.

Other programs, like *BLAST Professional*, all of the *Crosstalks*, both *Relay Gold* packages, and *HyperAccess/5*, also offer high-speed proprietary protocols. With proprietary protocols, vendors can implement flow-control and compression algorithms more efficiently since they control the protocol at both ends.

SCRIPTING

One of the real powers of a communications program is its scripting feature. Scripts range from simple lists of statements resembling DOS batch files to complex programming languages like *Crosstalk Mk.4*'s CASL, *HyperAccess/5*'s HyperPilot, *Procomm Plus*'s Aspect, *Professional YAM*'s scripting language, and *Smartcom III*'s SCOPE.

Using one of these languages, you can create a program that automatically places a call to an information service, requests

specific information such as stock quotes, analyzes the data, and informs you if any specific stock price exceeds certain parameters. Communications software companies typically maintain bulletin board systems or CompuServe forums containing libraries of current scripts. Finding a single interesting script can convince you to buy one program over another.

COM-AND, *Crosstalk Mk.4*, *Crosstalk for Windows*, *HyperAccess/5*, *PereLine*, *Procomm Plus*, *Relay Gold*, *Rexxterm*, *Smartcom III*, and others provide a "learn" feature that automates the scripting process by recording your keystrokes and the replies received from the other system.

PROBLEMS EVERYWHERE

Novices and even experienced computer users often find communications packages difficult to run. And while the companies that produce communications software are much to blame, they aren't alone.

There are three points where a file transfer can cause frustration: the interface between the PC and the local modem, the connection between modems, and the interaction between the programs.

THE HAYES ESP: Keeping the Pace with V.32bis Modems

by Steve Rigney

When you can't keep up with high-speed data transfer, what do you do? You buy the Enhanced Serial Port (ESP) board from Hayes Microcomputer Products. The ESP board, a \$399 add-in board with two serial ports, lets your PC accept the full throughput of a V.32bis modem without loading down the CPU. This is true especially in multitasking environments where the CPU is already heavily used.

TWO PORTS

All serial ports, including the two on the Hayes ESP, use a UART (Universal Asynchronous Receiver/Transmitter) to move data between the RS-232 interface and the PC's CPU. In standard configurations, the UART issues a constant stream of interrupts to the CPU, asking it to unload data. The ESP board moves data to memory using direct memory access (DMA), which

is much faster than using interrupts.

Each port on the Hayes ESP serial board uses the new 16550AFN UART to control data flow between its on-board 8031 processor and the 9-pin RS-232 port. The National Semiconductor 16550AFN UART contains a 16-byte FIFO (first in, first out) buffer that mediates the flow of data between the serial port and the CPU. The 8031 and other hardware on the board add more buffering and handle the DMA actions.

The Hayes ESP board offers two modes of operation: compatibility mode and enhanced mode. The compatibility mode utilizes the capability of the 16550AFN UART to give you the best state-of-the-art operation using standard interrupt line techniques. You can use this mode with any software. The enhanced mode provides advanced flow control, 1K FIFO receive-and-transmit buffers, and DMA block-move action. Unfortunately, you must have software with drivers specifically designed for the ESP board to use this mode. However, Hayes provides communications drivers that all Windows and OS/2 applications can use. ■

OUR CONTRIBUTORS

Frank J. Derfler, Jr. is the senior networking editor of *PC Magazine*.

Rick Ayre is PC Magazine Labs' project leader for software reviews.

Stuart R. Greenberg is the senior programmer at PC Magazine Labs.

Angela Gunn is a researcher/reporter at *PC Magazine*.

M. David Stone is a contributing editor to *PC Magazine*.

Gary Berline, Jonathan Matzkin, Wendy Dugas Pérez, John R. Quain, Steve Rigney, M. Keith Thompson, and Nate Zelnick are frequent contributors to *PC Magazine*.

Stephen Satchell is an independent consultant retained by Ziff-Davis Labs for telecommunications testing.

Incompatibilities between modems from different manufacturers, particularly with new products, are a major problem (see "Maximum Modems: 14,400 bps and Rising," March 17, 1991). You can either buy modems only of the same make and model, or give vendors time to work out their incompatibilities. But the other two file-transfer problems are within the control of the communications software.

With the exception of Hayes's *Smartcom III* and *Smartcom Exec*, which list only Hayes modems on their setup menus, each communications program contains a list of modems from different vendors they are programmed to set up. *Telx* and *Procomm Plus* lead the list with settings for 200 modems, although a quick search of the Ziff-Davis Computer Library database revealed that there are over 1,000 modems on the market.

If your software lists your specific make and model of modem, you can hope that the setup is correct and detailed enough for all your tasks. If your modem isn't on the list, you face a challenge. You can attempt to use a setup for a generic modem following the Hayes AT command setup string. This might work for dialing and automatic answering, but for little more. Or create a "customized" modem profile for the communications software.

Some standards are beginning to address the problem. An ANSI modem interface standard is emerging but is still too broad in the critical areas of flow control. The CCITT has a V.25bis standard for modem interfaces, but the commands are

limited and the modem must know the speed and parity of the incoming commands before it can read anything. None of these efforts has had much effect on compatibility. Many modems are still a mystery to many communications packages.

NOT YET

Unless vendors are able to resolve these differences, you should probably stick with a communications program that supports your modem, particularly if it's V.32 or V.32bis. Call the vendor and ask if your modem make and model are on the company's setup menu. If not, start looking for a new communications package.

U.S. ROBOTICS

BLAST Professional

by Steve Rigney

BLAST (BLOcked ASynchronous Transmission) is a lingua franca for file transfers. The proprietary protocol of *BLAST Professional* allows different computers running different operating systems to pass files across an asynchronous link.

BLAST Professional, Version 10.5, developed by the Communications Research Group, now a division of U.S. Robotics, has a DOS version, of course. Other *BLAST Pro* packages sold by CRG work with Unix, Xenix, Macintosh, Digital's VMS, and several other operating systems. The DOS version is priced at \$169. *BLAST Pro* can cost up to \$695 for a server environment.

Novices will find *BLAST Pro* easy to use. Typically a novice can install *BLAST Pro* and begin communicating within minutes. Experienced users will find that BLAST provides a capable scripting language and setup menus to establish untended connections over many different links, including dial-up and leased telephone lines, X.25, and ISDN networks.

The program includes an ASCII text editor that uses *WordStar* commands for creating messages and scripts. The scripting language, while not as powerful as the

languages found in *Professional YAM* or *Smartcom III*, is similar to BASIC and easy to use.

BLAST Pro includes setup strings for 25 different modems, scripts for connecting to CompuServe, MCI, Tymnet, and other services, and approximately 17 terminal emulation options such as ANSI, TTY, and DEC VT52. You can use *BLAST Pro*'s powerful macro language to emulate a particular terminal or define your own keyboard setup.

BLAST runs over both IPX and NetBIOS LANs and supports INT 14 and NASI for sharing modems on the network.

REMOTE CONTROL

One of the unique aspects of *BLAST* is its proprietary protocol, dubbed BLAST. Similar to Zmodem, the BLAST protocol is a full duplex protocol that allows you to manually specify packet size and other fields in order to improve file-transfer speed. *BLAST Professional* completed most PC Magazine Labs benchmark tests and proved to be faster than most of its competitors when using a proprietary protocol.

BHOST, a remote-control host program for DOS-based machines, is packaged with *BLAST*. It allows you to remotely control another person's PC or have another person control yours. BHOST uses the BLAST file-transfer protocol and offers security features to protect data as it is being remotely controlled.

Communications Research Group of-

*If your software
doesn't list your
specific modem model,
you face a challenge.*



FACT FILE

BLAST Professional, Version 10.5
U.S. Robotics, 8100 N. McCormick Blvd.,
Skokie, IL 60076; 800-342-5877, 708-982-
5010
List Price: \$169; server version, \$695
Requires: 350K RAM, DOS 2.0 or later
In Short: *BLAST Pro*'s many different
versions make it a great problem solver for
transferring files between computers running
different operating systems. The DOS product
works well and includes a remote-control
program that adds to its value.

CIRCLE 475 ON READER SERVICE CARD

COMMUNICATIONS COMMUNICATIONS SOFTWARE

fers toll-free technical support to all of its customers. Support is available from 7:30 to 6:00 CST, Monday through Friday.

BLAST Pro is a solution to interoperability problems, but it works well for DOS-to-DOS connections as well. And if you need remote-control functions, **BHOST** in itself is a good reason to buy this product.

SUPPORTWARE COM-AND

by Wendy Dugas Pérez

If good file-transfer performance and complex scripting are what you need, Caber Software's **COM-AND**, Version 2.8, distributed by SupportWare, is a steal at \$50.

Setting up **COM-AND** is easy, particularly if you have one of the modems included in the ten setup strings. If not, you can use the Hayes setup string or write your own. **COM-AND** lets you set hardware and software flow control, and does not limit the number of comm ports.

There is a wealth of documentation; just printing it out will take several hundred pages. While there is no context-sensitive help, there is a screen listing of commands. You can have an unlimited number of phone books, each with up to 100 to 200 entries. From the phone book, you can import and export ASCII files as well as phone books from other programs, including *Procomm* and *Qmodem*.

POWERFUL SCRIPTS

COM-AND includes prewritten communications scripts for most major services, including CompuServe, Dow Jones, and PC MagNet. People who have more specialized needs can create their own using

COM-AND's powerful scripting language, which features more than 300 verbs. There is also an auto-learn function.

The program features mini-BBS functions and terminal emulations and can run on Novell's *NetWare* and other networks. It also features password security and call logging.

Technical support, although free, requires a toll call. Hours are 8:00 A.M. to midnight PST, Monday through Friday. A 24-hour bulletin board is also available for **COM-AND** users.

DIGITAL COMMUNICATIONS
ASSOCIATES INC.

Crosstalk for Windows

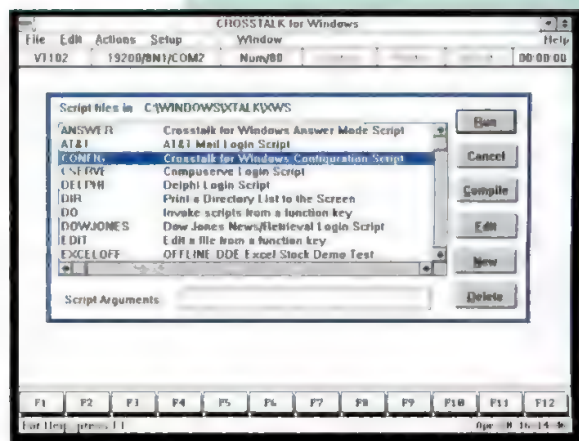
by John R. Quain

If you think that using Windows means never having to open a reference manual, then Digital Communications Associates' *Crosstalk for Windows*, Version 1.2.1, is the communications package for you. With a list price of \$195, *Crosstalk's* implementation of the standard Windows interface will attract users looking for features and flexibility in a well-behaved package.

Since the last time we reviewed it ("Asynchronous Communications Software: Improving Information Access," April 30, 1991), *Crosstalk for Windows* has added queue dialing, network support, and DEC VT-220 and 320 terminal emulations. It now includes a Windows installation program as well.

The entire package, which requires about 900K of disk space, also features many icons, as well as ten predefined scripts, including files for MCI, CompuServe, OAG, Lexus/Nexus, and Dow Jones. When you select one of the supplied scripts—or add your own phone book entry—the program allows you to choose an icon and add it to the program group for easy launching.

The phone book can accept an unlimited number of entries, and each number can accept the global defaults or be configured individually. A handy note feature attaches reminders, such as obscure



Crosstalk for Windows's graphical user interface allows you to select, edit, and compile scripts in its native CASL language.

BBS commands or infrequently used passwords, to entries.

Many features that are seldom employed effectively in Windows applications are managed with aplomb by *Crosstalk*. For example, error messages can accurately tell you what went awry. You can resize and move windows, even while dialing, and prompt dialog boxes can be moved aside while communications are underway.

Crosstalk includes approximately 70 preset modem initialization files. In addition to the standard Xmodem, Ymodem, and Zmodem protocols, *Crosstalk* supports Kermit with sliding windows, DART (a crash-recovery protocol), and *Crosstalk's* own zippy protocol. When initiating a new entry for, say, CompuServe, it also allows you to enter your password and user ID for making automatic log-ons.

File transfers, such as those under Zmodem, are tracked in a window with the number of blocks, bytes received, time remaining, and characters per second displayed. You can move the dialog box out of the way during a transfer or hide it from view. An audio and screen prompt alert you when a transfer is finished.

Crosstalk for Windows's implementation of Zmodem is auto-starting; there's no need to make a "receive Zmodem transfer" request. If you dial up, get interrupted, and dial back hours—or even days—later, the file transfer continues from where you left off. Though this fea-



FACT FILE

COM-AND, Version 2.8

SupportWare, One World Trade Center, P.O. Box 32187, Long Beach, CA 90832-2187; 310-439-6104, BBS 310-439-7714.

List Price: \$50

Requires: 312K RAM, DOS 2.1 or later.

In Short: *COM-AND* offers good file-transfer performance and an in-depth scripting language. As shareware, it is a good value, but its documentation should be simplified. It can run on Novell's *NetWare* and other types of networks.

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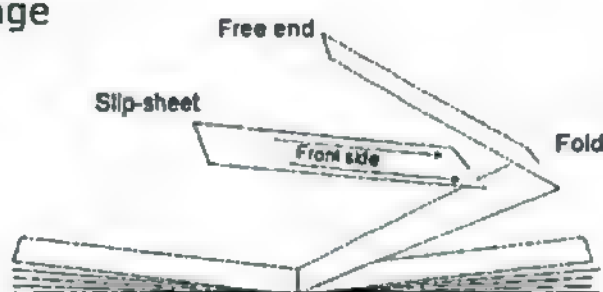
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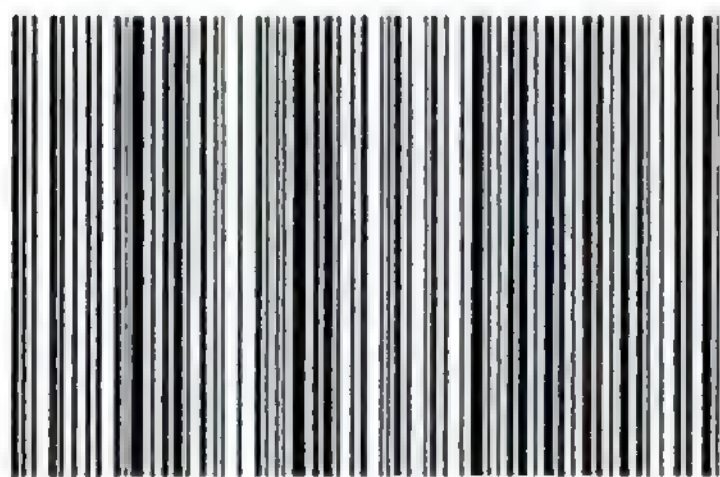
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3. Slice the folded edge
4. Close the page and slip-sheet



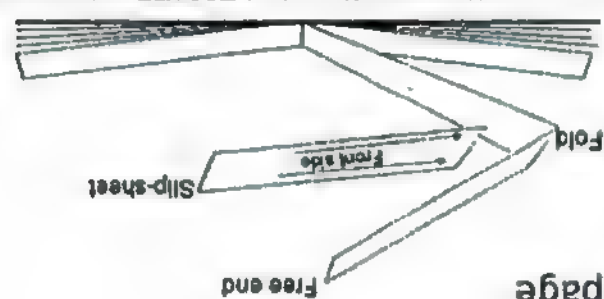
Foldout slip-sheet

Inverted Foldout slip-sheet



GbsSlipSheet-001

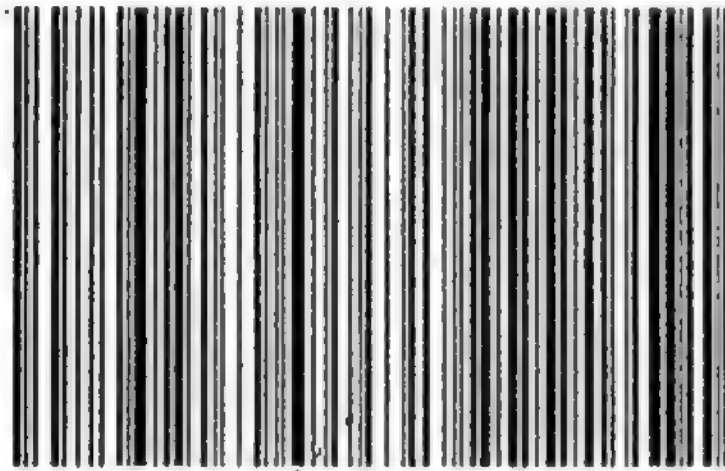
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Back

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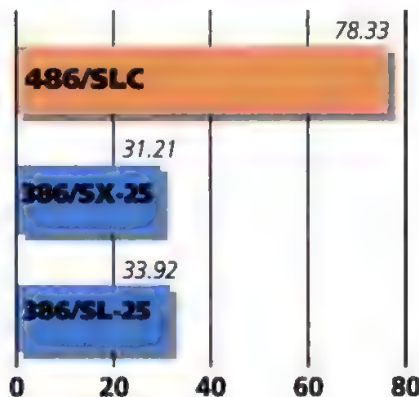
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ture worked well in typical BBS downloading situations, in PC Magazine Labs' exhaustive tests, *Crosstalk* failed to recognize an old version of our test file and overwrote the newer version in the Zmodem Interrupt test. It was not alone in this failing. *Dynacomm* and *Relay Gold for Windows* yielded similar results.

With a maximum transmission speed of 19.2 kilobits per second, Xmodem-1K test results for *Crosstalk* were considerably slower than *Dynacomm* running at the same speed. In general, *Crosstalk* was slightly faster than other packages running at the standard Windows speed, but it was easily outpaced by packages, such as *Unicom* and *Microphone II*, that can take advantage of Windows 3.1's faster comm driver. (A new release of *Crosstalk for Windows 3.1* now offers speeds up to 115.2 Kbps, but it was not available in time for testing.)

COMMUNICATIONS, WINDOWS STYLE: A New Driver, a New Procomm

by Angela Gunn and Stephen Satchell
Microsoft Windows 3.1's new communications driver gives it a much-needed performance boost. But it's not all it could be.

The comm driver in Windows 3.0 limited communications programs to selectable speeds of 19.2 kilobits per second. Programs could either list options for impossible speeds or replace Microsoft's driver with a proprietary one: a dangerous proposition.

Times have changed, and the comm driver in Windows 3.1 theoretically accommodates connections of up to 57.6 Kbps; not as fast as the 115.2 Kbps possible with a direct-connect serial link between two PCs, but fast enough for V.32bis modems communicating over phone lines. Windows 3.1 now also supports the buffering capabilities of the 16550AFN UART chip for Windows applications. This chip handles the difference between the single-bit data stream the modem pulls in off the phone lines and the 8-bit flow the CPU can handle. The 16-bit buffer in the 16550AFN can keep sending and receiving data when the processor is busy, thus keeping the traffic from becoming stop-and-go.

Corporate users should appreciate several of the program's more sophisticated features. A global prefix number option is included, for example, so that calls will automatically dial out of your switchboard. *Crosstalk for Windows* also supports INT 14 for Novell NetBIOS and IBM LANACS networks, and contains terminal emulations for DEC VT-52, 100, 102, 220, and 320, as well as IBM 3101.

Compared with DCA's other communications packages, *Crosstalk for Windows* most resembles *Crosstalk Mk.4*, though it does not have the extensive terminal support, and the CASL scripting language has been amended. The language extensions now support Windows' dynamic data exchange (DDE), enabling similarly supported Windows applications to exchange and update information. The lan-

Windows itself is also operating more efficiently, passing data to the driver in multiple blocks, rather than one bit at a time. The Control Panel now allows the serial port IRQs and port addresses to be manually reset from the Windows defaults; this allows greater flexibility for all your peripheral devices. And it clears up Windows 3.0's nonstandard default COM3 and COM4 problem; Windows 3.1 natively supports four comm ports and can support up to nine with third-party drivers.

One of the first communications packages designed specifically to utilize the 3.1 driver is *Procomm Plus for Windows* (Datastorm Technologies, Columbia, Missouri; \$149, or \$69 to upgrade from any registered version), which should be out by the time you read this. A beta version allowed full-speed serial communication at 115.2 Kbps, by setting the 16550AFN itself. Developers at Datastorm expressed some dismay over the speed limitations put on the drivers by Microsoft. However, the larger problem—hardware and software crippled by the inadequate and outdated RS-232C serial port standard—remains. ■



FACT FILE

EDITORS' CHOICE

Crosstalk for Windows, Version 1.2.1

Digital Communications Associates Inc., 1000 Alderman Dr., Alpharetta, GA 30202-4199; 800-348-3221, 404-442-4000.

List Price: \$195.

Requires: Microsoft Windows 3.0 or later.

In Short: With one of the best Windows implementations in this roundup, *Crosstalk for Windows* is easy to operate and manage. Though it doesn't have all the features of larger packages and is more expensive than other Windows-based offerings such as FutureSoft's *Terminal Plus*, *Crosstalk* surpasses the others in convenience and flexibility.

CIRCLE 477 ON READER SERVICE CARD

guage is powerful and flexible, with an auto-learn function and script compiler.

Many users familiar with the DOS incarnations of *Crosstalk* will appreciate the Windows version's ease of use, though the speed penalties may dissuade a few. DCA does not have a toll-free tech support line, though it does offer free support to customers via a regular toll call (8:00 A.M. to 8:00 P.M. EST, Monday through Thursday, and 8 to 6, Friday), or through its 24-hour BBS. There's also a forum on CompuServe (GO XTALK). Although its price and features place it between massive packages like *Dynacomm* and straightforward programs like *Unicom*, *Crosstalk for Windows* ought to appeal to users at both ends of the spectrum.

DIGITAL COMMUNICATIONS
ASSOCIATES INC.

Crosstalk Mk.4

Crosstalk Communicator

by M. Keith Thompson

Crosstalk Mk.4, Version 2.1, from Digital Communications Associates, combines power, flexibility, and ease of use in a \$245 package that provides custom interfaces, automation of repetitive tasks, diverse connection options, and multiple simultaneous communication sessions.

If that price tag seems a bit steep, look at the \$99 *Crosstalk Communicator*, Version 2.0, a limited version of *Mk.4*. *Communicator* offers an identical interface without *Mk.4*'s command line interface, multisession and network support, and synchronous links.

Installation of *Crosstalk Mk.4* is

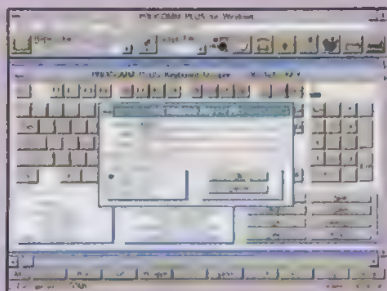
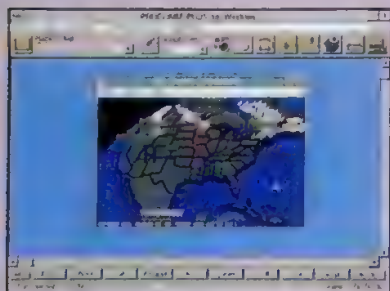


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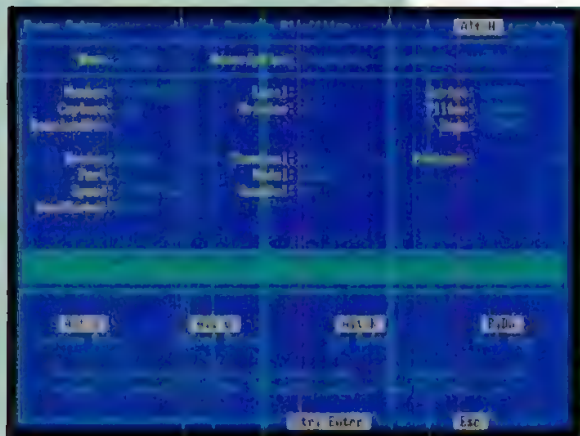
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Crosstalk Mk.4 gives you several ways to add the setups for your dialing directory. You can also run the program in multiple sessions, as shown at the top of this screen.

straightforward and quick. You simply type A:INSTALL and answer a few menu options about which comm port you want to use and the type of modem you have. To be sure things are working properly, *Mk.4* queries your computer for available comm ports and tests the modem after you select it from the menu.

Mk.4 combines the power of a command line interface with the ease of a menu-driven program. At program start time, *Mk.4* displays the list of entries in your phone book. You simply point and shoot and the program dials your host. Simple Alt-key combinations change the various parameters for your system or communications session.



FACT FILE

Crosstalk Mk.4, Version 2.1
Crosstalk Communicator, Version 2.0
Digital Communications Associates Inc., 1000 Alderman Dr., Alpharetta, GA 30202-4199; 800-348-3221, 404-442-4000.
List Price: *Crosstalk Mk.4*, \$245; *Crosstalk Communicator*, \$99
Requires: 320K RAM, DOS 3.0 or later.
In Short: A powerful but easy-to-use program, *Crosstalk Mk.4* provides multiple communications sessions, a robust scripting language, and many terminal emulations. *Crosstalk Communicator* lacks some of its features, notably its multiple-session capability, but is a good bargain.

CIRCLE 478 ON READER SERVICE CARD

The real power behind *Mk.4* comes from its ability to manage multiple communications sessions. For example, you can be connected to your corporate mainframe with an IRMA card in one session, your office in Atlanta on a modem in another session, and your DEC VAX all at the same time. To change sessions, you use the Alt key and the number of the session you want to make

current. *Mk.4* also comes with an extensive and high-quality set of approximately 30 terminal emulators, including ANSI, VT-52, and VT-320.

Mk.4's multisession ability slows it down slightly, however. It rated in the middle of the pack on PC Labs benchmark tests, although its proprietary DART protocol worked well.

CANNED SCRIPTS

Mk.4 comes with many canned scripts for various information services, such as CompuServe and MCI Mail. These allow you to log onto services, download mail, and browse forums. They also serve as excellent examples of how to write your own scripts.

Mk.4 comes with a versatile, powerful scripting language: CASL. More than just a communications scripting language, CASL provides over 370 commands and functions capable of just about any programming task. The documentation includes a brief tutorial and a complete command reference. The program also comes with an auto-learn scripting functions.

Mk.4 includes an ample text editor as well. You can't replace it with your favorite one; you can, however, shell to DOS and run the editor of your choice. *Mk.4* remains in memory, taking up about 320K, and continues to keep the connection alive.

Crosstalk Mk.4 offers everything you need in a communications program, including a robust scripting language, a variety of terminal emulations, and scripts for many on-line services. With *Mk.4*'s flexible connection options, you can communicate with multiple hosts over a variety of media.

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COMMUNICATIONS COMMUNICATIONS SOFTWARE

DIGITAL COMMUNICATIONS
ASSOCIATES INC.

Crosstalk XVI

by M. Keith Thompson

In 1983, DCA's *Crosstalk XVI* set the standard for reliable PC communications. Today, over 1 million people still use *XVI* for their day-to-day communications needs. At \$195, *XVI* is a bit expensive, but new features in Version 3.8 keep *XVI* a viable contender in this market.

DCA has added seven new protocols including Zmodem, CompuServe B, and Ymodem-G. New scripting commands allow better control of *XVI* for various speed connections and more flexible dialing options. *XVI* also includes log-on scripts for many on-line services, including CompuServe and Dow Jones News/Retrieval. There's a separate Modem Initialization (MI) string for each dialing entry, a Speed Lock (SL) feature, and LS for Long distance Suffix. The Speed Lock feature tells *XVI* to lock the interface speed between the computer and the modem and allows you to get the maximum through-

put from data-compressing modems. The Long distance Suffix option allows you to enter a credit-card number to make communicating on-the-go simple.

XVI held its own against the newcomers on PC Labs benchmark tests, settling in the middle of the pack.

ONE MENU

While *XVI* is not the easiest program to learn, once you know how it operates you can get around quickly. The program includes over 60 modems in its setup menu. *XVI* includes only one menu: the settings screen. You change the communications parameters by typing the first two characters of the setting shown on the screen. For example, to change the DTE speed, you type SP followed by the speed (SP alone displays a list of choices). Help is available at any time by typing HELP, or HELP followed by the command name.

Options such as which port to use, how to handle carriage return/line feeds, the default file-transfer protocol, and what type of terminal to emulate reside in the settings for each dialing entry. You can-



FACT FILE

Crosstalk XVI, Version 3.8

Digital Communications Associates Inc., 1000 Alderman Dr., Alpharetta, GA 30202-4199, 800-348-3221 404-442-4000

List Price: \$195

Requires: 120K RAM DOS 2.0 or later

In Short: For years it was the standard by which other products were measured. Today's *Crosstalk XVI* includes support for 16550AFN UARTs and the Zmodem protocol, but it lacks a well-designed menu system and a script-learning feature.

CIRCLE 479 ON READER SERVICE CARD

not save protocol settings by dialing entry, however, as you can with *HyperAccess/5*. You can set the Xmodem types (CRC, checksum, 1K, or G), but the protocols are separate. The program offers unlimited phone books and unlimited entries. *XVI* includes a useful set of scripting commands. Its 119 verbs allow you to automate repetitive tasks, such as data captures from a host and PC-to-PC file transfers. But *XVI*'s script commands fall short in complex tasks.

Although it lacks the fancy menus and

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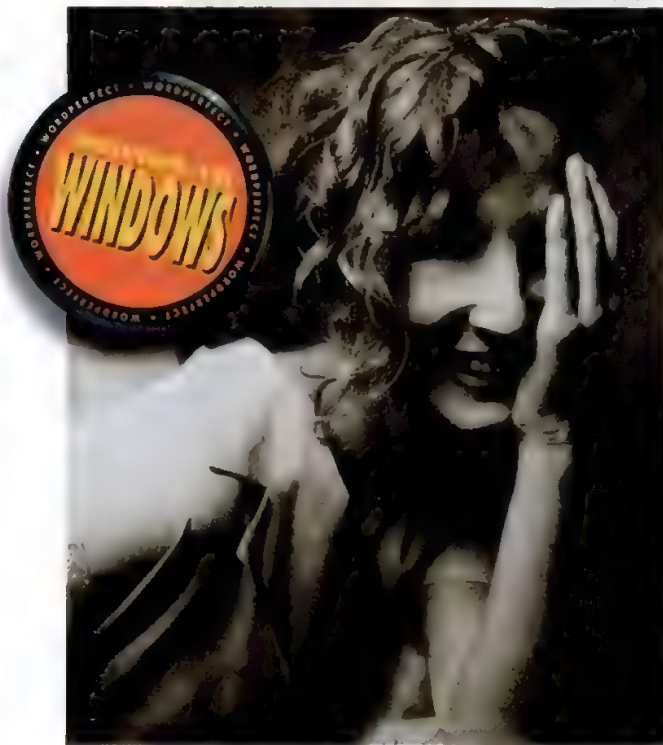


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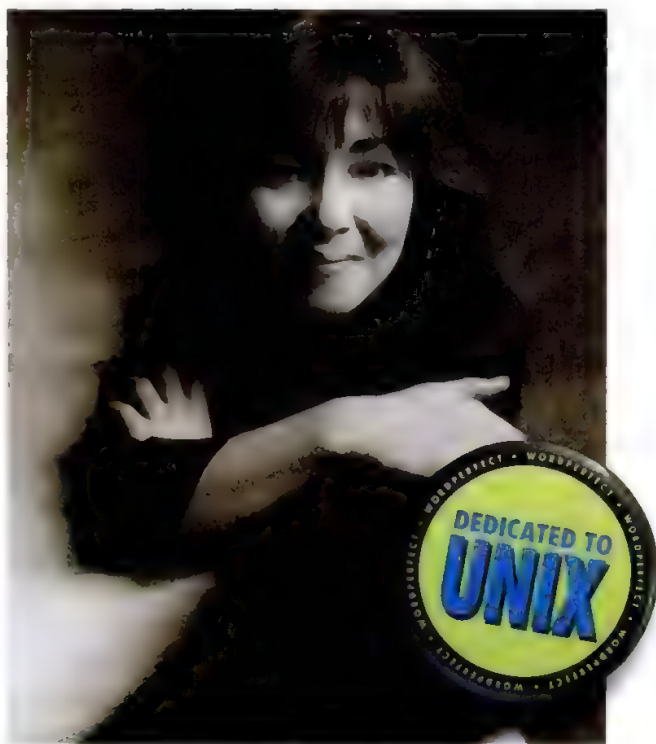
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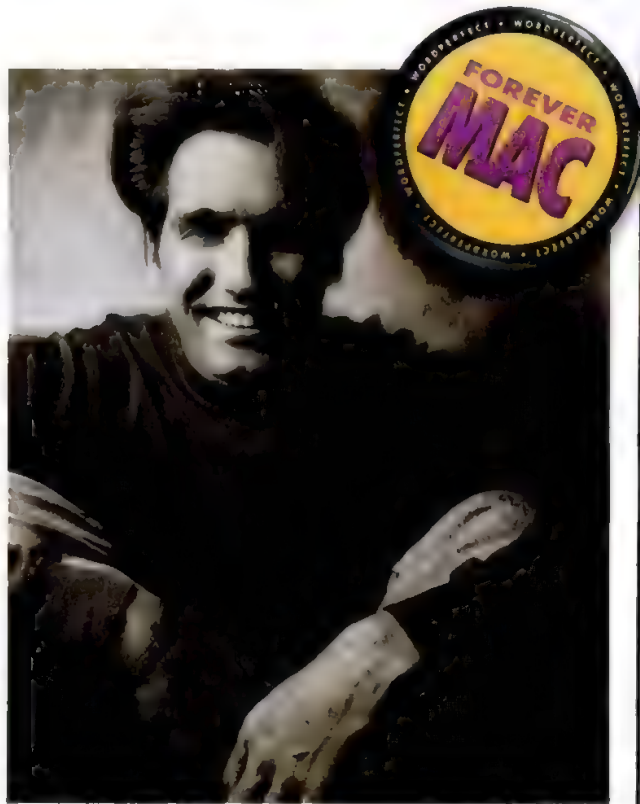
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extras that some of the newer programs possess, XVI still does all of the things it did nine years ago. It is a viable contender, although not as robust as *Crosstalk Mk.4* and *Crosstalk Communicator*. XVI continues to have many followers, and DCA's commitment to product upgrades keeps the program fresh.

FUTURESOFT INC.

Dynacomm Asynchronous for Windows Terminal Plus

by John R. Quain

Even GUI applications can't be all things to all users, and FutureSoft's *Dynacomm Asynchronous for Windows*, Version 3.0, is no exception. Although this \$249 package boasts a wide variety of network and terminal support, it still lacks a few Windows maneuvering capabilities.

Unlike some Windows packages, *Dynacomm* does not automatically build

icons for predefined scripts, though it contains scripts for such services as MCI Mail, Delphi, BIX, CompuServe, AT&T Mail, and Dow Jones News Retrieval. You can launch scripts by calling the file or by using *Dynacomm*'s Director, which allows you to select and modify scripts from a directory.

Changing parameters for a new log-on takes longer in *Dynacomm* than in most of the other Windows contenders here, but all the options, including character and communications parameters, are clear and easy to follow. Although it supports Zmodem, however, *Dynacomm* won't automatically initiate Zmodem transfers and in the Zmodem Interrupt test, it overwrote a file with an older version.

Other features include a rudimentary host mode, a text editor, a search option, and a handy but slow file finder. Additions to this release include the ability to store settings in separate files and a queue dialing feature. But *Dynacomm* has fallen behind the others in many respects. When we last reviewed it, for example, *Dynacomm* had only four predefined modem

setup files, and it still has only four. According to FutureSoft, a new release expected this summer will include a list of over 100 initialization strings.

One particular nuisance is *Dynacomm*'s inability to resize its window or activate menus while the modem dials. Closing dialog boxes can also be frustrating: Many file bar close commands do not respond, making it necessary in Help, for example, to return to the main menu to exit.

Where *Dynacomm* shines in comparison to other Windows packages is in its corporate capabilities. *Dynacomm* has extensive network hooks, offering support for INT 14 and a variety of protocols, including ComBIOS, NetBIOS, DEC LAT, Pathworks, and Hewlett-Packard's VT.

Dynacomm's 14 terminal emulations include IBM 3101 and less common settings, such as TeleVideo 925/950, Data General 470C, and MiniTel emulations, along with three other network connectors. DEC terminal emulations include VT52 to VT220 settings (a VT320 graphics emulation will be in the next release).

The program also includes a potent scripting language that resembles BASIC



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FACTFILE

Dynacomm Asynchronous for Windows, Version 3.0

Terminal Plus, Version 3.1

FutureSoft Inc., 1001 S. Dairy Ashford, #101, Houston, TX 77077; 713-496-9400, BBS 713-588-6870.

List Price: *Dynacomm*, \$249; *Terminal Plus*, \$99.95.

Requires: 180K RAM, Microsoft Windows 3.0 or later.

In Short: One of the first Windows communications package on the market, *Dynacomm*'s experience pays off in thorough network and terminal support but, oddly enough, not in making the most of Windows. *Terminal Plus*, a bargain, includes many of the larger program's primary features, plus one or two of its own.

CIRCLE 400 ON READER SERVICE CARD

and has over 300 verbs. The language supports dynamic data exchange (DDE) and can be used for such tasks as pushing communications speeds up to 57.6 Kbps, building dynamic dialog boxes, supporting synchronous communications, and running multiple parallel scripts.

If *Dynacomm*'s approach but not its price appeals to you, FutureSoft offers

Terminal Plus, a smaller \$99.95 Windows package for individual users. It is a subset of *Dynacomm* that includes most of its corporate cousin's features. And though it lacks the network support, has less-extensive scripting (275 out of *Dynacomm*'s 300 verbs), and only six of *Dynacomm*'s terminal emulations, it does have some tricks of its own.

Terminal Plus's main advantage over *Dynacomm* is its interface and use of dialing directories. You can group numbers, each with its own setup file, into directories of 200 entries or less. Shipped with the product are 3 directories with approximately 200 predefined entries to access on-line services. According to FutureSoft, many of these features will also be incorporated into the new release of *Dynacomm*.

Despite some sticky windows, *Dynacomm* is a powerful package worth considering in a corporate setting or by those with heavy scripting demands. Technical support, offered weekdays from 7:30 to 6:30 CST, is free, though you'll have to pay for the call; Yahtzee fans will appre-

ciate the game's inclusion here when waiting for long downloads.

HILGRAEVE INC.

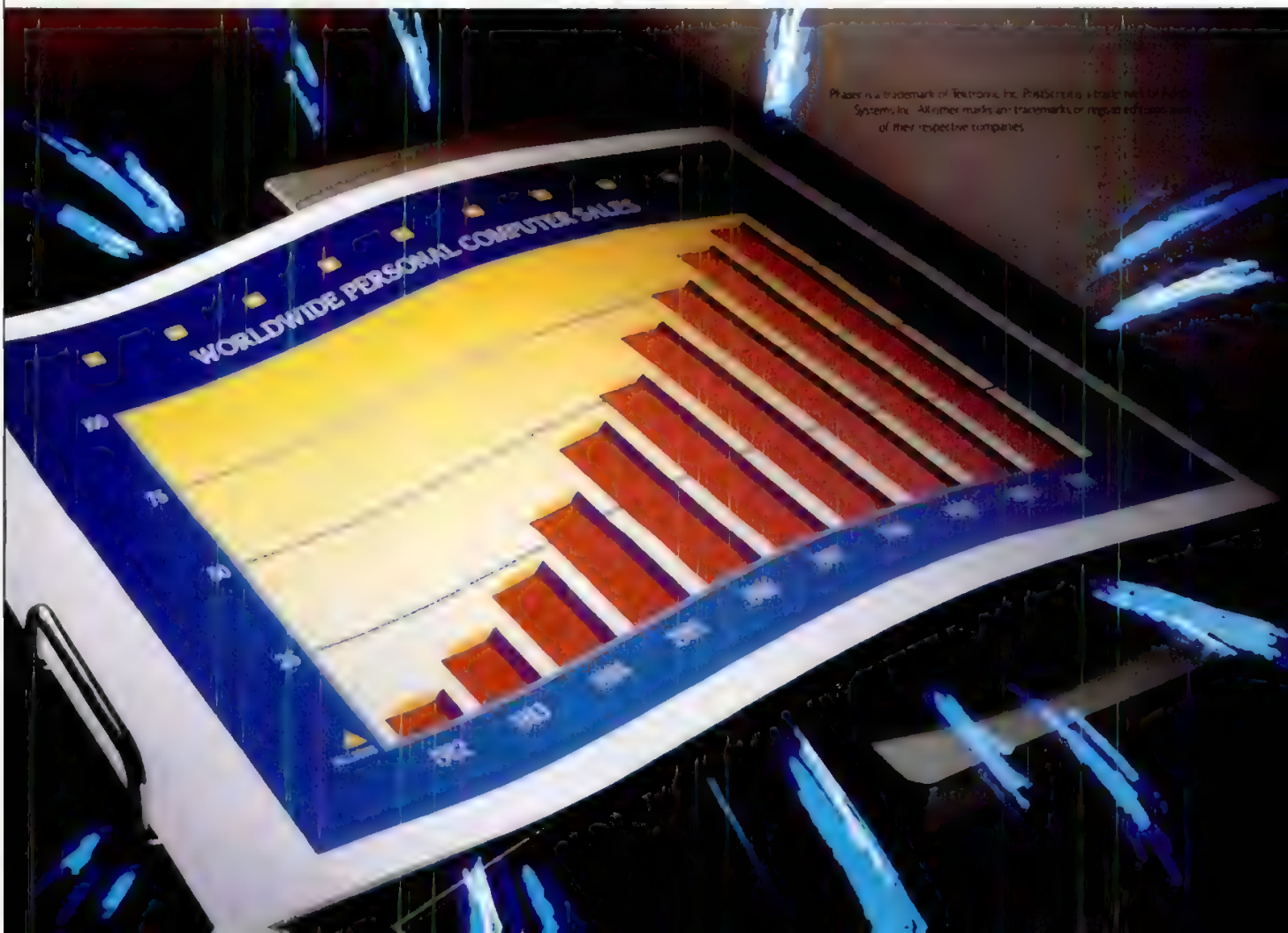
HyperAccess/5

by M. Keith Thompson

Hilgraeve's *HyperAccess/5*, Version 2.1, strikes a fitting balance between power and simplicity. It offers a complete set of features, ease of use, and OS/2 support in one \$199 package. The DOS-only version of the package sells for \$99.95.

HA/5 is speedy. Although the differences among all the packages in transfer times on PC Labs' benchmark tests were small, *HA/5* consistently ranked among the top performers. HyperProtocol, Hilgraeve's own protocol, provides excellent throughput on 286-based computers and modems without V.42bis compression.

The program prompts you through installation and automatically creates the necessary directory and systems settings. *HA/5* includes support for 165 modems. *HA/5*'s menus offer a point-and-shoot



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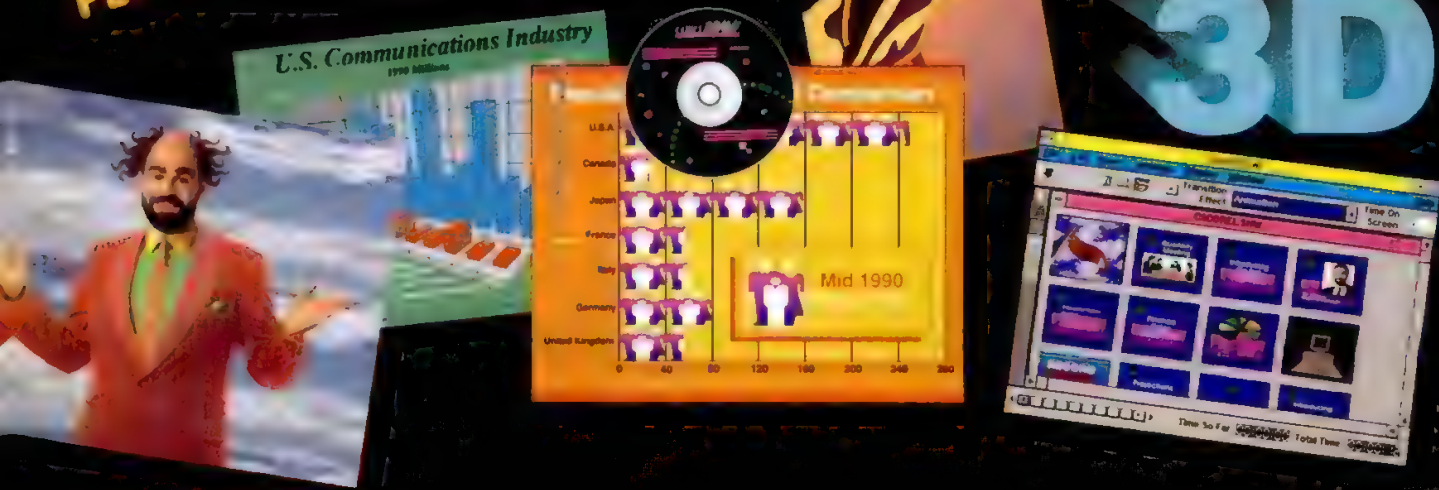
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HyperAccess/5's straightforward, intuitive menus make it easy to configure the communications settings for the remote services you want to call.

interface for the novice user and one-key navigation for advanced users. Context-sensitive help is always available with the Alt-H key combination.

HA/5 comes with many predefined systems to call from the phone book. You'll find all the settings (parity, stop bits, terminal emulation, file-transfer protocol, and so on) needed to make a successful connection. HA/5 2.1 now includes many predefined scripts to move around the services once you are connected, including MCI Mail, CompuServe, Dow Jones News/Retrieval, and GENie. You can still easily create your own script using the learn feature.

HYPERPILOT

HyperPilot, *HA/5's* scripting language, includes more than 150 commands. The manual contains a short tutorial on using the language and a complete command listing of HyperPilot. HyperPilot is a procedural language and closely resembles C's programming structure. It is not as

FACT FILE EDITORS' CHOICE

HyperAccess/5, Version 2.1

Hilgraeve Inc., 111 Conant Ave., #A, Monroe, MI 48161; 800-826-2760, 313-243-0576.

List Price: DOS version, \$99.95; DOS and OS/2 compilation, \$199.

Requires: 350K RAM, DOS 3.0 or later.

In Short: *HyperAccess/5* is flexible and easy to use. Its powerful scripting language and excellent modem support make it a good choice.

CIRCLE 481 ON READER SERVICE CARD

complete a language as *Crosstalk's* CASL, but it is much easier to use than *Professional YAM's* scripting language.

With *HA/5 2.1*, you don't get support for multiple sessions but you do have INT 14 support. An OS/2 version of the product, identical to the DOS version, is included in the *HA/5* package. Oddly, although it is a character-based implementation, it is still the leading package available for OS/2.

HA/5 has all the features to handle day-to-day communications and its simple menu structure and flexible dialing entry settings make it a good choice.

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SOFTWARE VENTURES CORP.

Microphone II for Windows

by John R. Quain

If you're looking for a fast Windows communications program, you're reading the right review. It isn't flawless, but Software Ventures' *Microphone II for Windows*, Version 2.0, will allow speeds higher than the 19.2-Kbps setting in Windows 3.1—and in Windows 3.0. For \$129, down from \$295 a year ago, *Microphone II* has also added Zmodem and dynamic data exchange (DDE) to this release.

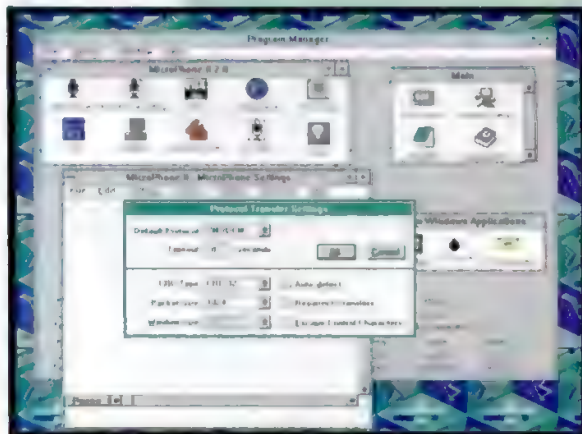
Even with Zmodem, though, *Microphone* still lacks important protocols like Kermit and CompuServe B support. It also has fewer terminal emulations (VT52, VT100, VT102, ANSI, and TTY) than most of the other Windows packages, making it inappropriate for corporate communications.

On the other hand, individual users will appreciate many of the program's

features. Installed icons enable you to launch computer services like BIX, CompuServe, and Dow Jones. Most of the supplied scripts create buttons at the bottom of the screen for such tasks as composing, reading, and addressing messages. You can also run multiple sessions, enabling you to simultaneously read mail on one service, download a file on another, and create a message on a third.

An icon for changing communications settings makes it easy to adjust global defaults, and *Microphone* supports over 30 modems with preset initialization files. However, the program employs an unusual method of matching service files with settings files. Most of the time it is transparent to the user, but making modifications can be confusing.

The beefed-up scripting language in-



Microphone II for Windows is one of the fastest Windows communications packages currently available. It allows users to launch sessions to popular services from an icon, as well as tailor protocol settings to individual needs.

cludes an easy-to-use script recording feature. There are also several handy

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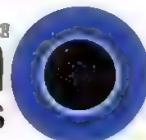
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FACT-FILE

Microphone II for Windows, Version 2.0

Software Ventures Corp., 2907 Claremont Ave., #220, Berkeley, CA 94705; 800-336-6477, 510-644-3232.

List Price: \$129.

Requires: 256K RAM, Windows 3.0 or 3.1.

In Short: Both *Microphone II* and *Unicom* (also reviewed here) offer speeds beyond 19.2 kilobits per second in Windows 3.1, but *Microphone II* is the only one that can do the same for Windows 3.0. It is a comfortable, reasonably priced package for first-time users, but it lacks some features necessary in corporate environments.

CIRCLE 482 ON READER SERVICE CARD

scripting functions accessible from a menu.

Among the Windows packages we tested, *Microphone II* was the only one to replace the Windows 3.0 comm driver with one of its own. With the *Microphone* comm driver you can set speeds of 38.4, 57.6, and 115.2 Kbps—far beyond 3.0's 19.2-Kbps limit. However, some other applications will not work with the driver. You can use the Windows comm driver, but that requires you to edit your SYSTEM.INI file.

Under Windows 3.1, *Microphone* uses the higher-speed Windows 3.1 comm driver. *Microphone II* for Windows and Data Graphics' *Unicom* are the only two packages we tested that took advantage of the Windows 3.1 comm driver, with mixed results.

In straight ASCII screen captures, *Microphone* was the fastest. Aside from the 57.6-Kbps transmission speed, *Microphone*'s performance can also be attributed to its jump scrolling, which is considerably quicker than the standard line-by-line Windows approach. In Xmodem tests, *Microphone* was slightly slower than *Unicom*, though the two ran neck and neck in straight Zmodem transfers. Users should note, however, that at this high-transfer rate, a 386 or older PC will bog down. Consequently, at 57.6 Kbps, *Microphone* had to make as many as 10 retries on a 25-MHz Compaq 386 during a Zmodem download.

Although it technically failed our Zmodem Interrupt test, *Microphone II* can automatically initiate Zmodem transfers and perform resurrections of aborted downloads. Unlike other failing packages, which actually overwrite identically named files, *Microphone II* for Windows creates a new file and stores the previous

COMMUNICATIONS COMMUNICATIONS SOFTWARE

version. This approach may result in some redundancy of files on your disk, but it adds an extra level of security to Zmodem transmissions.

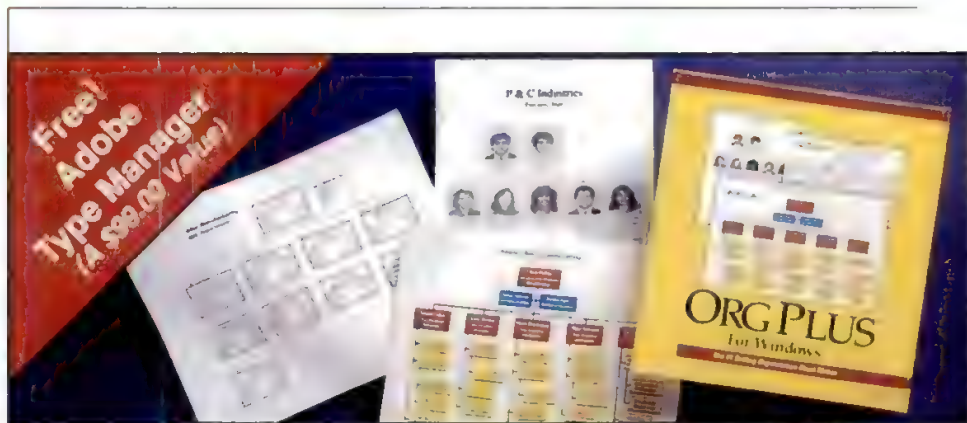
Support is offered via a 24-hour BBS. There's also free phone support (9 to 4:30, PST, Monday through Friday), though you'll have to pay any long-distance charges yourself.

SOFTKLONE DISTRIBUTING CORP.

Mirror III

by Nate Zelnick

SoftKlone's \$149 *Mirror III*, released in 1985, added scripting to features that largely resembled *Crosstalk XVI*'s structure. Its Prism scripting language remains *Mirror*'s strongest feature, but the pro-



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OS/2

*In Canada, call 1 800 495-1234. **Upgrade from Windows. \$49; upgrade from DOS. \$99. OS/2 base operating system. These prices valid only when ordered directly through IBM. Dealer prices may vary. Offer valid in U.S.A. only, expires 7/31/92. HelpWare limited to U.S.A. only. IBM and OS/2 are trademarks of International Business Machines Corporation. All other products are trademarks or registered trademarks of their respective owners. © 1992 IBM Corp.



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gram is not for the casual or uninitiated user. Its stark command line interface is often easier to use than its menu-driven dialing directory.

Mirror III whizzed through PC Labs' benchmark tests but could not handle high-speed tests using the 16550AFN UART. SoftKlone plans to offer better support of the 16550AFN in Version 2.5, along with 132-column support, which should be available by the time you read this review.

Two scripting languages are offered in *Mirror III*, one which it borrowed and enhanced from *Crosstalk XVI* and the far more robust Prism. With more than 300 verbs, you can control, extend, and customize nearly every aspect of the program. There is also a rich selection of sample scripts, including ones for CompuServe, MCI, and Dow Jones. *Mirror III*



FACT FILE

Mirror III, Version 2.2

SoftKlone Distributing Corp., 327 Office Plaza Dr., #100, Tallahassee, FL 32301; 904-878-8564

List Price: \$149; *Mirror III Fax*, \$249; *Mirror III LAN*, \$195.

Requires: 256K RAM, DOS 2.0 or later.

In Short: With its two scripting languages, *Mirror III* is particularly well suited to those who need powerful communications scripts. But its steep learning curve and daunting interface are not for novices. A Windows version should be shipping now.

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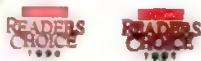


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Back-UPS 800RT	Small business, home office, LAN nodes, 386SX machines, 286, small PWS systems, and interconnecting hardware such as routers, bridges, gateways and hubs.	\$399
Back-UPS 1200VX	Small business, home office, LAN nodes, 386SX machines, 286, small PWS systems, and interconnecting hardware such as routers, bridges, gateways and hubs.	\$499

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does not compile its scripts, but its compression mode can significantly reduce file size. *Mirror III* also offers Class 1 fax support and security. Finally, there is a built-in *WordStar*-like text editor, but you can also use your own.

At \$149, *Mirror III* is a higher investment than many of the DOS-based products reviewed here, both in terms of price and learning time. But the power and flexibility of its scripting languages may make it worthwhile to dedicated communicators in its planned Windows version.

MAGICSOFT INC.

MTEZ

by Wendy Dugas Pérez

MTEZ, Version 1.17, a modular telecommunications package from MagicSoft, lets you assemble its features according to your needs. But *MTEZ*, options and all, is still missing out on features found in most other comm packages.

Aside from the basic package, *MTEZ* offers five different modules, with support for various protocols and emulations, scripting, MNP compression, cellular communications, and facsimile.

Individually, it costs \$50 for the basic package, \$19 for the Protocols and Emulations Module, \$39 for the Script Language Module (which includes the Protocols and Emulations Module), \$29 for the MNP Add-on Module, and \$49 for either the Cellular Add-on Module or the ExpressFax Add-on Module. A network version of *MTEZ* that supports INT 14 is available separately; contact MagicSoft for pricing information.

Special prices for various combinations are available. We tested basic *MTEZ* with the Protocols and Emulations, Script



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COMMUNICATIONS SOFTWARE

Language, and MNP modules, a \$99 combination.

The basic *MTEZ* package provides support for DEC VT102 terminal emulations as well as ANSI, ANSI-BBS, and TTY. You also get Xmodem, Ymodem, Ymodem-G, and Ymodem batch file-transfer protocols, but *MTEZ* does not support external protocols. The Protocol and Emulation Module provides additional terminal emulations, Zmodem with recovery, CompuServe B+, Kermit, and Kermit client-mode file-transfer capabilities, a text editor, and keyboard-mapping capabilities.

The Script Language Module has only 99 verbs and no auto-learn function, features commonly found in better communications packages. The MNP Add-On Module adds MNP levels 2, 4, and 5 to non-MNP modems. The ExpressFax Module offers background send/receive fax capabilities and is available in a send-only version. Technical support hours are 9:00 to 5:00 CST Monday through Friday, and there is a 24-hour BBS.

With its modular approach, *MTEZ* is priced on a par with other packages, and buyers don't have to pay for features they

don't need. But the program is not a well-rounded communications package. And even with add-ons, it still has its limitations.

PERELINE DATA SYSTEMS INC.

PereLine

by Wendy Dugas Pérez

PereLine, Version 3.0, from PereLine Data Systems, blends the best of two worlds: It's got the pricing (\$49.95) of a shareware package, but the documentation and presentation of a commercial one.

PereLine lists more than 50 modems on its setup menu, and offers bit-per-second rates up to 115,200. If your PC has two modems or direct connect lines, you can communicate with two different PCs at the same time via two active

windows. The package also allows file transfers in the background. *PereLine* performed well on PC Labs' Zmodem Transfer test but lagged in the Screen Capture, Xmodem, and Direct Connect tests.

PereLine's Visual File Manager lets you tag, copy, rename, move, edit, and transfer files, make directories, or change drives. Playing music files and viewing .RLE/.GIF graphics are a couple of its special features. Its scripting language includes almost 200 verbs and the program includes scripts for services such as MCI Mail and CompuServe. There is also a learn mode. *PereLine* includes an editor (PED) or you can incorporate your own. Additional features include a mini-BBS, context-sensitive help, call logging, and nearly 20 terminal emulations.

A network license is available for \$149.95. *PereLine* supports Novell's NACS (using the NASI interface) and any modem server supporting the NCSI interface or extended BIOS INT 14 calls.

Technical support is a toll call, although it's free and available from 8:30 to 5:30 PST. The BBS runs 24 hours a day. The product also carries a 30-day money-back guarantee.

*Playing music files
and viewing .RLE/.GIF
graphics are a couple
of PereLine's special
features.*



FACT FILE

PereLine, Version 3.0

PereLine Data Systems Inc., 750 Camden Ave. #B, Campbell, CA 95008; 800-359-6612, 408-364-2770, BBS 408-364-2789

List Price: \$49.95.

Requires: 220K RAM, DOS 3.0 or later.

In Short: An inexpensive commercial package with a shareware price, *PereLine*'s interface, documentation, and features are what you would expect to find in higher-priced packages. It even includes extras, such as a file manager and a text editor.

CIRCLE 486 ON READER SERVICE CARD

Overall, *PereLine* provides a good communications package for the budget-conscious.

LEAD TECHNOLOGIES INC.

Pilot

by Jonathan Matzkin

Lead Technologies' *Pilot*, Version 2.1, is a simple communications package that is good for simple tasks. The \$49 program is a standalone version of the communications component of the company's *Lead-view* image transmission product. Although it did well on most of PC Magazine Labs' benchmark tests, *Pilot* was unable to download an ASCII file successfully at high speed (57,600 bps). The program does not support automatic Zmodem downloads; these had to be initiated manually on the receiving PC.

The program is easy to set up and uses function key commands listed across the bottom of the main screen. *Pilot* is fine for basic file-transfer and electronic mail uses and as a simple BBS, but its lack of features and capabilities prevents it from handling more demanding communications tasks.



FACT FILE

Pilot, Version 2.1

Lead Technologies Inc., 8701 Mallard Creek Rd., Charlotte, NC 28262, 800-637-4699, 704-549-5532.

List Price: \$49.

Requires: 256K RAM, DOS 3.0 or later.

In Short: A basic shareware communications package that is good for simple file transfers and e-mail use, *Pilot* was not able to negotiate the more challenging parts of our test suite.

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FACT FILE

MTEZ, Version 1.17

MagicSoft Inc., 376 E. Saint Charles Rd., #300, Lombard, IL 60148, 708-953-2374, BBS 708-953-2366

List Price: BASIC version, \$50; Protocols and Emulations Module, \$19; Protocols and Emulations Module and Scripting Module, \$39; MNP Add-on Module, \$29; Cellular Add-on Module, \$49; ExpressFax Add-on Module, \$49. Special bundling prices: *MTEZ* Complete (*MTEZ* with Protocols and Emulations Module and Scripting Module), \$79; with the MNP Add-on Module also, \$99; with the ExpressFax Add-on Module also, \$139; with the Cellular Add-on Module also, \$159.

Requires: 185K RAM, DOS 2.0 or later.

In Short: *MTEZ*'s modular approach to communications is well done, providing seamless integration for the user. But some of its basic communications features are not as in-depth as they need to be and performance is generally slow.

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8288 ☐ DR DOS 6.0	67.
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7725 ☐ Direct Access 5.1	64.
3950 ☒ Fastback Plus 3.0	119.
Fox Software ... NCP	
6188 ☒ FoxPro 2.0	489
Geoworks ... NCP	
5217 ☐ Geoworks Pro	129.
Gibson Research ... NCP	
9832 ☒ SpinRite II 2.0	64.
Hayes ... NCP	
7983 ☒ Smartcom EXEC 2.1	75.
Helix Software ... NCP	
9627 ☐ Netroom 2.1 (single user)	65.
IBM ... NCP	
2866 ☐ DOS 5.0 Upgrade	59.
ICOM Simulations ... NCP	
1326 ☐ Intermission 3.0 for Windows (May '92)	29
5696 ☒ Squeegie for Windows (May '92)	42



Adobe Systems ... NCP

5988 ☒ Adobe Illustrator 4.0 Competitive Upgrade—Owners of other major draw and design programs can trade up to Illustrator 4.0 for Windows. Includes ATM, TypeAlign, Separator, 40 fonts, pre-drawn artwork, & more. Valid thru 8/31/92 \$189.

value's the rage

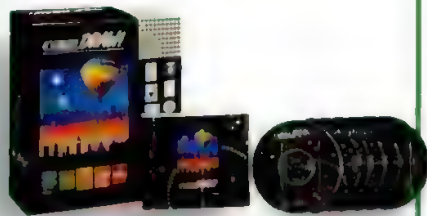


Inset Systems ... NCP

3820 **HiJaak 1.0 for Windows**—Enhances & prints graphics images. Converts 23 raster, 15 vector, & 24 fax card formats. Captures graphics screens from Windows and graphics & text screens from DOS applications. \$139.

Individual Software ... NCP

6222	Resume Maker 1.3	29.
Inset Systems ... NCP		
7298	HiJaak 2.1	139.
3820	HiJaak 1.0 for Windows	139.
7300	Inset Plus HiJaak	165.
Intuit ... NCP		
2426	Quicken 5.0	45.
5596	Quicken 1.0 for Windows	45.
2474	Quicken with QuickPay	75.
LaserTools ... NCP		
6882	PrintCache 2.5	99.
Lotus ... NCP		
5417	1-2-3 3.1 Plus	399.
5653	1-2-3 2.3	335.
1852	1-2-3 2.3 Upgrade	95.
2755	1-2-3 1.0 for Windows	399.
2747	1-2-3 for Windows & Ami Pro 2.0 Upgrd	199.
5799	Ami Pro 2.0	299.
1847	Ami Pro Competitive Upgrade	95.
3523	Freelance 1.0 for Windows	349.
5981	SmartSuite	469.
2750	cc:mail DOS Platform Pack	129.
2748	cc:mail Windows Platform Pack	335.
2749	cc:mail 25 user Pack	399.



Corel Systems ... NCP

5506 **CorelDRAW 2.0**—"CorelDRAW 2.0 is worth every penny. Special effects can even turn inexperienced artists into master draftsmen." Luisa Simone of PC Magazine... \$365.
2610 **CorelDRAW 3.0 for Windows**... 449.

M-USA Business Systems ... NCP

3408	Pacioli 2000 2.0 (Accounting software)	\$32.
MECA ... NCP		
4879	One-Write Plus Payroll 3.0	45.
3978	One-Write Plus Accounting 3.0	79.
4880	One-Write Plus Accounting Works 3.0	119.
5825	Money Matters 3.0	29.
2798	Managing Your Money 8.0	49.
Microcom ... NCP		
4408	MicroCourier 1.0	59.
6234	CarbonCopy Plus 6.0	119.
4410	CarbonCopy Plus for Windows	119.
Micrografix ... NCP		
3627	Windows Draw! 3.0	99.
Micro Logic Software ... NCP		
8579	MoreFonts 3.0	75.
Microsoft ... NCP		
3338	Money 1.0 for Windows	45.
7010	Windows 3.1	45.
7388	Project 3.0 for Windows	45.
2904	Works 2.0	95.
2735	Works 1.0 for Windows	129.
3337	Publisher 1.0 for Windows	129.
7387	PowerPoint 2.0 for Windows	300.
6195	Word 2.0 for Windows	300.



Lotus ... NCP

5921 **SmartSuite**—Your single solution for working in Windows. SmartSuite includes four full-featured, powerful business applications—1-2-3 for Windows, Ami Pro, Freelance Graphics and cc:Mail, all at a great price. \$469.

2856	Excel 4.0 for Windows	309.
8137	Office 2.0 for Windows	479.
1620	MS-DOS 5 Upgrade	49.
1624	Visual Basic 1.0	129.
Multisoft ... NCP		
4925	PC-Kwik Power Pak w/Power Disk	79.
Niles & Associates ... NCP		
3880	EndNote Plus 1.0	149.
Nolo Press ... NCP		
5122	For The Record 2.0	35.
2982	WillMaker 4.0	39.
Norton-Lambert ... NCP		
2753	CloseUp for Windows & DOS Dual Pack	129.
Novell ... NCP		
4000	Netware Lite 1.0	69.
Okna ... NCP		
9696	Desktop Set 3.0 for Windows	79.

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Micro Management Corporation

PC Connection
6 Mill Street
Marlow, NH 03456

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SALES 603/446-0004 FAX 603/446-7791



Delrina ... NCP

5974 **DosFax PRO 2.0**—Has many of the same features & ease-of-use that earned WinFax PRO 3 industry awards in 1991. Fax documents from any DOS application. Works with any SendFax, Class I or Class II compatible fax modem. \$49.

Panaces ... NCP

2413	WinSpeed 1.0 (Windows accelerator)	55.
PC Globe ... NCP		
5902	PC Globe 5.0	39.
5900	PC USA 2.0	32.
Personics ... NCP		
9288	Laptop UltraVision 2.1 (3 1/2" only)	59.
4384	Desktop UltraVision	59.
Polaris Software ... NCP		
4395	PackRat 4.0	249.
PowerUp! ... NCP		
7860	Calendar Creator Plus 4.0	52.
Qualitas ... NCP		
7539	386MAX 6.0	59.
7967	BlueMAX 6.0 for PS/2 (3 1/2" only)	79.
Quarterdeck ... NCP		
3221	Expanded Memory Mgr 386 6.0	59.
4586	DESQView 386 2.4	129.
QUE Software ... NCP		
4155	RightWriter 5.0	54.
Reality Technologies ... NCP		
6572	WealthBuilder 1.1	95.
Reference Software ... NCP		
4396	Grammatik V 1.0	55.
7483	Grammatik V 1.0 for Windows	55.
Roykore ... NCP		
2473	Instant ORG Charting! 1.0	125.
8162	ABC Flowcharter 1.1	189.
Sitka ... NCP		
6675	TOPS Network Bundle 3.0	159.
3720	Flash Card (hardware)	155.
Software Publishing ... NCP		
3482	Harvard Graphics 3.0	399.
4403	Harvard Graphics 1.0 for Windows	399.
Software Ventures ... NCP		
6889	MicroPhone II 2.0 for Windows	99.
Spinnaker ... NCP		
1415	PFS: WindowWorks 1.0	125.
Stac Electronics ... NCP		
1409	Stacker 2.0	85.
3524	Stacker 2.0 w/16-bit Coprocessor Card	185.
Strategic Mapping ... NCP		
4620	Atlas Pro 1.01	699.
Symantec ... NCP		
3784	The Norton Backup 1.2 for Windows	84.
3146	The Norton Utilities 6.0	115.
3425	Q&A 4.0	249.
7999	Norton Anti-Virus 2.0	84.
2359	The Norton Desktop 2.0 for Windows	99.
4431	Norton Desktop 2.0 & Windows 3.1	165.
8378	Norton PC Anywhere IV 4.5	119.

PC CONNECTION

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TIMESLIPS ... NCP

5698 ☐ **Timeslips Release 5**—See where your hours are going with Timeslips Release Five. Re-engineered for today's business and service professionals. New features including multiple billing rates and many new reports. . . . \$189.

Systems Compatibility ... NCP

3949 ☐ **The Writer's Toolkit 2.0 for Windows** . . . 79

Teleware ... NCP

9847 ☐ **M.Y.O.B. for Windows** . . . 139

TIMESLIPS ... NCP

5037 ☐ **TimeSheet Pro for Windows** . . . 135

5698 ☐ **TimeSlips Release 5** . . . 189.

Timeworks ... NCP

6253 ☐ **Publish-It! 2.0** . . . 85

Tool Technology ... NCP

3863 **WinTools 1.0 for Windows (3 1/2" only)** . . . 119

Touchstone Software ... NCP

7420 ☐ **Check It 3.0** . . . 85.

Traveling Software ... NCP

4407 ☐ **LapLink Pro 4.0** . . . 95.

WordPerfect Corporation ... NCP

4214 ☐ **WordPerfect Office PC** . . . 89.

3804 ☐ **WordPerfect 5.1** . . . 269.

3494 ☐ **WordPerfect 5.1 for Windows** . . . 279

Wordstar ... NCP

5148 ☐ **Wordstar 7.0 for DOS** . . . 269

3442 ☐ **Wordstar 1.0 for Windows** . . . 279

XTREE ... NCP

6161 ☐ **XTree Gold 2.5** . . . 95.

RECREATIONAL/EDUCATIONAL

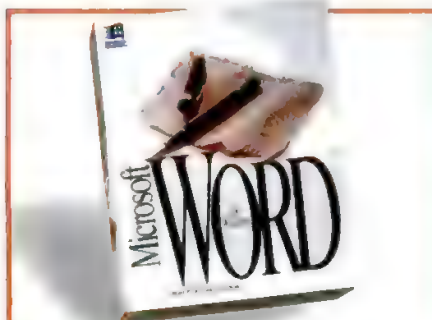
Abracadata ... NCP

3641 ☐ **Design Your Own Railroad** . . . 39.

5594 ☐ **Sprout 1.0 (May '92)** . . . 35.

5591 ☐ **Everybody's Planner 2.0** . . . 49.

3629 ☐ **Design Your Own Home-Architecture 3.0** . . . 49.



Microsoft ... NCP

6195 ☐ **Word 2.0 for Windows**—Everyday tasks are easy with the customizable toolbar, drag & drop movement of text, & instant character & page formatting from the Ribbon & Ruler. Includes drawing, charting & WordArt. . . \$309.

Broderbund ... CP

3340 ☐ **Kid Pix** . . . \$35.

8068 ☐ **Where in World is Carmen Deluxe** . . . 49.

1836 ☐ **Where in America's Past is Carmen** . . . 39.

5851 ☐ **SimCity from Maxis** . . . 29.

4388 ☐ **SimAnt from Maxis** . . . 39.

4411 ☐ **SimEarth for Windows from Maxis** . . . 45

Davidson & Associates ... NCP

3947 ☐ **Math Blaster Plus** . . . 29.

4183 ☐ **KidWorks** . . . 29.

Electronic Arts ... NCP

4534 ☐ **Mavis Beacon Teaches Typing 2.0 (CP)** . . . 35.

3031 ☐ **Mavis Beacon for Windows** . . . 45

3023 ☐ **ChessMaster 3000** . . . 35.

3032 ☐ **ChessMaster 3000 for Windows** . . . 39

Harvard Associates ... NCP

2324 ☐ **PC Logo 4.0** . . . 59.

HyperGlott Software ... NCP

(French, German, Italian, Spanish available.)

☐ **Word Torture for Windows** . . . ea 34

☐ **Word Torture 3.0** . . . ea. 29.

ICOM Simulations ... NCP

3717 **Sherlock Holmes, Consulting Detective (CD)** . . . 39.

Knowledge Adventure ... NCP

1483 ☐ **Sports Adventure 1.0** . . . 55.

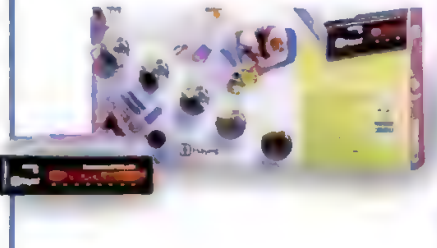
3861 ☐ **Knowledge Adventure 1.0** . . . 55.

Microsoft ... NCP

7881 ☐ **Entertainment Pack I for Windows** . . . 29

4079 ☐ **Pack II** . . . 29. 4077 ☐ **Pack III** . . . 29

2858 ☐ **Flight Simulator 4.0** . . . 39.



Hayes ... 2 years

1345 **OPTIMA 24 Modem**—An affordable high-speed V.42bis modem with the reliability and quality that made Hayes famous. Supports throughput up to 9600 bps. Incl. Smartcom EZ communication software . . . \$155.

Penton Overseas ... NCP

☐ **VocabuLearn/ce Levels I & II (French, Italian, German, Spanish, Russian, Hebrew and Japanese)** . . . ea. 35.

Personal Training Systems ... NCP

Training tutorials - beg. to adv. for Windows, Excel, PageMaker, WordPerfect, Ami Pro, Microsoft Word & Lotus 1-2-3 (3 1/2") . . . ea 65

Sierra ... CP

9466 ☐ **Space Quest IV (VGA)** . . . 45.

3193 ☐ **Police Quest III (VGA)** . . . 45.

Software Marketing Corp. ... NCP

5145 ☐ **Bodyworks 1.0** . . . 45.

Software Toolworks ... NCP

3294 ☐ **Game Pak (5 games in one)** . . . 32.

5032 **Miracle (piano teacher) (incl. kybd.)** . . . 325.

Spectrum Holobyte ... NCP

4834 ☐ **Super Tetris or 4833 for Windows** . . . ea. 29

Toyogo ... NCP

5138 ☐ **Go Master Deluxe 5.0 for Windows** . . . 99

5143 ☐ **Go Master Deluxe 5.0** . . . 99.

True BASIC, Inc. ... NCP

☐ **Kemeny/Kurtz Math Series** . . . ea. 45.

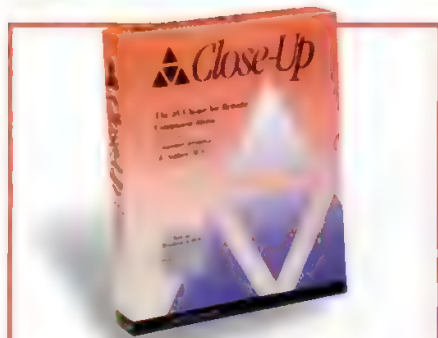
Walt Disney Computer Software ... CP

2629 ☐ **Mickey's 123's** . . . 29.

2624 ☐ **Mickey's ABC's** . . . 29.

4398 ☐ **The Animation Studio** . . . 79.

4416 **Sound Source** . . . 29.



Norton-Lambert ... NCP

2758 ☐ **Close-Up for Windows & DOS Dual Pack 4.0**—PC Magazine's Editors' Choice for controlling PCs miles away by modem. PC World's "Best Buy" for remote communications . . . intro. price until 6/30/92 \$129.

HARDWARE

Warranties listed next to manufacturer.

American Power ... 2 years

7108 **Smart UPS 400** . . . 339.

7105 **Smart UPS 600** . . . 439

3858 **Back-UPS 400** . . . 179.

3823 **Back-UPS 600** . . . 295.

Appoint ... limited lifetime

2469 **Thumbelina PC** . . . 62

2480 **MousePen Pro PC** . . . 62

ATI Technologies ... 2 years

9821 **VGA Basic-16 (640 x 480, 16 colors)** . . . 65.

9985 **VGA Integra (1024 x 768, 16 colors)** . . . 89.

2706 **VGA Wonder XL (with 1 MB)** . . . 199.

2382 **Graphics Vantage VGA (with 1 MB)** . . . 299.

9822 **8514/Ultra (with 1 MB) (requires VGA)** . . . 399.

2012 **Graphics Ultra with VGA (with 1 MB)** . . . 479.

1825 **2400etc/i Modem (with 9600 SendFax)** . . . 109.

9620 **9600etc/e Modem** . . . 369.

3902 **Stereo•F/X** . . . 145.

3900 **VGA Stereo•F/X (w/512K, upgrd. to 1 MB)** . . . 279.

Boca Research ... 5 years

7150 **BOCARAM/AT PLUS (2 MB)** . . . 189.

7139 **(4 MB)** . . . 279. 7138 **(8 MB)** . . . 459.

6998 **I/O Board for AT** . . . 49.

6999 **I/O Board for Microchannel (S/S/P)** . . . 95.

8380 **BasicVGA (256K, 640 x 480)** . . . 49.

8381 **SuperVGA (1 MB, 1024 x 768)** . . . 115.

3859 **2400 Internal Modem (V.42, MNP Level 5)** . . . 85.

2502 **2400 Baud Internal Modem** . . . 49.

4001 **2400 Baud External Modem** . . . 59.

Bravo Communications ... 2 years

7400 **2 Position Laser Compatible Switch Box** . . . 109.

Brown-Wagh ... 1 year

8578 **Creative Labs Sound Blaster** . . . 109

2336 **Creative Labs Sound Blaster Pro** . . . 189.

Caree ... 1 year

8158 **Typist Plus Graphics** . . . 389.

Canon ... 1 year

We are an authorized Canon Service Center.

7894 **BJ-10ex Printer (4.6 lb.)** . . . 329.

7897 **BubbleJet Ink Cartridge (BJ-10ex)** . . . 23.

7896 **BJ-10ex Sheet Feeder** . . . 75.

Cardinal ... 1 year

2719 **MB2296SR Internal Send/Receive Fax** . . . 95

1132 **386-SX-16 Motherboard 01K** . . . 215.

1197 **386-SX-25 Motherboard 01K** . . . 239.

1480 **Cardinal 9600 Internal Modem** . . . 265.

2783 **Cardinal 9600 External Modem** . . . 299.

CH Products ... 1 year

7935 **Game Card III Auto** . . . 33. 7341 **MCA** . . . 49.

7340 **FlightStick** . . . 45.

CoStar ... 1 year

1418 **AddressWriter** . . . 479.

1947 **LabelWriter II** . . . 185.

to improve with age.



Intel ... 5 years

Intel Satisfaxion Modems—Fax from Windows or DOS as easily as you print. In 4 different performance ranges and prices. All include FAXability software ... see line listings.

COVOX ... 1 year	
5543	Sound Master II ... 145.
Curtis ... lifetime	
1708	Ruby-Plus SPF-2+ ... 65.
7358	Command Center SPF-4 ... 89.
Cyril Corporation ... 5 years	
MATH COPROCESSORS	
9875	FasMath 83D87-25 ... 159.
9876	FasMath 83D87-33 ... 169.
9877	FasMath 83S87-16 (SX compatible) ... 99.
Epson ... 2 years	
We are an authorized Epson Service Center.	
5555	AP-3250 (80 col., 200 cps, 24 pin) ... 239.
1906	FX-850 (80 col., 264 cps, 9 pin) ... 319.
1904	FX-1050 (136 col., 264 cps, 9 pin) ... 449.
2358	LQ-570 (80 col., 252 cps) ... 289.
2361	LQ-870 (80 col., 330 cps) ... 489.
2357	LQ-1170 (136 col., 330 cps) ... 669.
5184	LX-810 (80 col., 180 cps, 9 pin) ... 185.
Hauptpage Computer ... 1 year	
9034	33 MHz 386N Motherboard for AT (1 MB) 789.
3670	33 MHz 486 Motherboard for AT ... 1229.
4008	Win/TV ... 439.
Hayes ... 2 years	
7391	ULTRA 96 Modem ... 669.
5024	ULTRA 144 Modem ... 799.
1345	OPTIMA 24 Modem ... 155.
3522	OPTIMA 96 Modem ... 389.
9884	Pocket Edition 2400 ... 119.
Hewlett-Packard ... 1 year	
3175	DeskJet 500C (color) (with toner) ... 749.
3957	LaserJet IIP Plus (with toner) ... 879.
9993	LaserJet IIIP (with toner) ... 1099.
6754	LaserJet III (with toner) ... 1599.
Intel ... 5 years	
3864	14.4EX Modem ... 549.
7880	9600EX Modem ... 469.
1086	Matched Memory Classic Memory Brd. 0K 139.
5990	SatisFAXtion Model 100 ... 99.
5992	SatisFAXtion Model 200 ... 299.
5994	SatisFAXtion Model 400 ... 399.
5995	SatisFAXtion Model 400E ... 459.
5999	☐FAXability Plus ... 79.
8903	Matched Memory 4 MB (PS/2) ... 199.
Matched Memory (for LaserJet IIP, III, IIIP IIID)	
1810	1 MB ... 89. 1787 2 MB ... 149.
3076	Snap-In 386 (for PS/2 50/60 & IBM AT) ... 389.
MATH COPROCESSORS	
4750	80387SX (16 MHz 80386SX CPU's) ... 129.
6830	80387SX-20 (20 MHz 80386SX CPU's) ... 139.
5409	80387DX ... 219.

Kensington Microware ... 1 year

Full line available. Partial listing.

4973	PowerTree 20 (6 outlets, EM/RFI Filtering) \$27.
2582	Master Piece Plus ... 99.
2587	Master Piece Remote ... 105.
7899	Expert Mouse serial ... 99. 7900 bus ... 115.
3311	MasterStand ... 59.
3312	LaserStand (for HP LaserJet) ... 125.
Keytronic ... 3 years	
4518	101 Plus Keyboard ... 99.
Kraft ... 5 years	
5800	3 button Thunder Joystick ... 29.
Logitech ... limited lifetime	
3996	Trackman 2 (combo) ... 84.
2343	Trackman Portable ... 99.
7975	ScanMan 256 ... 269.
1322	FotoMan (camera for your PC) ... 549.
4727	Kids Mouse ... 45.
3295	MouseMan (combo) 69. 9766 (cordless) 89.
Megahertz ... 5 years	
3020	T224FM 96/24 Pocket Fax Modem ... 249.
1187	T324FM 96/24 Fax Modem (Toshiba Lptps) 269.
Micron Technology ... 2 years	
7595	2 MB Expansion for HP LaserJet IIP or III 119.



Practical Peripherals ... lifetime

2425 PM14400FXSA Modem/Fax—Get ultra high speed 14,400 bps data transmission as well as Group III S/R fax capabilities in one integrated and affordable package. Includes QuickLink II for modem and fax communications ... \$399.



Pacific Data ... 1 year

5729 □ProTracer—A Printer/Plotter capable of producing fast laser quality A to C-size (17" x 22") CAD drawings & impressive text documents all at a breakthrough price \$1099.

Microsoft ... lifetime	
7597	Microsoft Mouse (bus or serial) ... 85.
2897	Mouse with Paintbrush (bus or serial) ... 99.
2898	Mouse with Windows 3.0 (bus or serial) ... 149.
1896	Ballpoint Mouse (serial only) ... 119.
MicroSpeed ... 1 year	
2763	MicroTRAC (serial & PS/2 interface) ... 57.
6330	PC-TRAC Trackball (PS/2) ... 75.
6007	serial ... 75. 6008 bus ... 89.
Microtek ... 1 year	
2736	ScanMaker 600G (gray-scale scanner) ... 759.
2739	ScanMaker 600Z (color scanner) ... 1249.
Mouse Systems ... lifetime	
3213	PC Trackball II (serial) ... 65. 5609 (bus) ... 77.
7878	PC Mouse III (serial) ... 69. 7877 (bus) ... 79.
5613	Little Mouse/PC (serial) ... 69. 5601 (bus) ... 77.
5978	PenMate ... 209.
5979	NewPoint ... 79.

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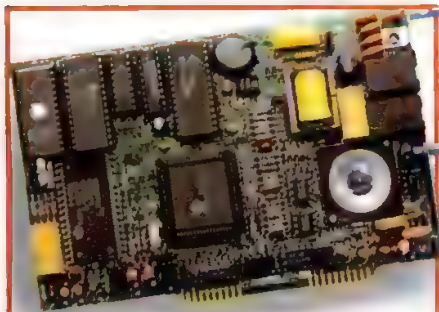


Prometheus ... 2 years

6009 OmniLink Laser—Automatically receive and print fax messages on plain bond paper with your laser printer. Your PC does not even need to be on ... \$425.

800/800-0004.

8090	Pacific Connect w/1.25 MB	\$349.
5729	ProTracer (personal CAD printer) (1 yr.)	1099.
PC Power & Cooling ... 2 years		
REPLACEMENT POWER SUPPLIES		
3203	Turbo Cool 200.	149.
7915	Turbo Cool 300.	159.
Practical Peripherals ... lifetime		
3103	2400 Baud Internal Modem	79.
3102	2400 Baud External Modem	99.
8993	2400 Baud Internal Modem (V.42 bis)	115.
8994	2400 Baud External Modem (V.42 bis)	125.
8132	PM2400 Pocket Modem.	109.
2266	PM9600 Internal Modem	275.
7934	PM9600SA Modem	289.
2264	PM2400FX96 (int. modem/fax)	95.
1344	PM2400FX96SA (ext. modem/fax)	99.
3803	PM14400FX96 (int. modem/fax)	359.
2425	PM14400FXSA (ext. modem/fax)	399.
Prometheus ... 2 years		
1222	ProModem Ultima Home Office	489.
6009	OmniLink Laser	425.
Targus ... lifetime		
1305	Universal Notebook (computer case)	69.
TheComplete PC ... 2 years		
5828	TheComplete Communicator	299.
Tripp Lite ... 2 years		
6199	Isobar 4-6 (4 outlets, Gold Seal Warranty)	49.
6200	Isobar 6-6 (6 outlets, Gold Seal Warranty)	59.
6201	Isobar 8-12 (8 outlets, Gold Seal Warranty)	69.
5549	BC400 Battery Backup	169.
Video 7 ... 7 years		
9768	VRAM II VGA 1 MB	329.
Zoom Telephonics ... 7 years		
1307	Int. 2400 Baud w/9600 Baud Fax Modem	99.
1178	Ext. 2400 Baud w/9600 Baud Fax Modem	99.
1181	2400 Baud V.42 bis Modem (2 year)	115.
3574	Ext. 2400 Baud V.42/9600 Baud Fax	145.
3386	FaxModem AFC (2400 baud modem, 9600 send, 4800 receive fax)	69.
4430	FaxModem AFX	79.
4429	FaxModem V.32bis (internal)	259.
4428	FaxModem V.32bis (external)	289.



Prometheus ... 2 years
1222 ProModem Ultima Home Office—Integrated system of data, fax & voice. 14,400 bps data modem with V.42bis/MNP 5 data compression & error correction, plus 9600 bps send/receive fax, & full voice capability \$489.

DRIVES

Colorado Memory Systems ... 1 year		
4194	Jumbo 120 Tape Backup	199.
4354	Jumbo 250 Tape Backup	269.
Conner Peripherals ... 1 year		
2339	CP30104 120 MB IDE HD (19 ms)	399.
1337	CP3204 200 MB IDE HD (16 ms)	599.
IOmega ... 1 year		
We are an authorized Iomega Service Center.		
2224	Bernoulli II Transportable 90 MB	799.
2616	Internal 90 MB Bernoulli	799.
2500	PC2B Controller	199.
2530	90 MB Cartridge	149.
2467	90 MB Cartridge Tripak	439.

Mountain Network Solutions ... 2 years		
2917	40-120 MB Internal Tape Drive	\$259.
3812	FS8500 IDE Tape Backup (304M)	569.
6153	DC2120 Tape Cartridge (5 pack)	149.
Pacific Rim ... 1 year		
1304	1.2 MB External (for any parallel port)	239.
2761	1.44EX MB External (for any parallel port)	239.
Quantum ... 2 years		
8304	Plus Hardcard II XL 50 MB (9 ms)	299.
8287	Plus Hardcard II XL 105 MB (9 ms)	449.
4060	105 MB Drive Kit for MC PS/2's (13 ms)	789.
TEAC ... 1 year		
6951	1.2 MB Drive for AT	65.
4670	1.44 MB Drive for PC/XT (3 1/2")	59.
4326	1.44 MB Drive for AT (3 1/2", w/Bastech)	79.
4951	720k Drive for PC/XT (3 1/2")	55.
4414	3 1/2"/5 1/4" Dual Floppy Drive	165.

MEMORY

6556	256k DRAM (100 ns, set of 9)	19.
5510	1 MB x 9 SIMMs (80 nanosecond)	45.
2497	4 MB x 9 SIMMs (80 nanosecond)	169.
5476	1 MB Chips (80 ns, set of 9)	45.



Canon ... 1 year
7894 BJ-10ex Printer—New enhanced version of the popular 4.6 lb. printer provides laser-like print quality (up to 360 dpi) on plain bond paper, envelopes or transparencies. Available in white or gray \$329.



AddStor ... NCP
4090 SuperStor 2.0—Double your disk capacity with an advanced, feature rich software only data compression product. Easy to install and use. Compatible with Windows and all applications \$83.

DISKS/MEDIA

3M ... lifetime		
3943	DC2000	17.
Fuji ... lifetime		
2214	3 1/2" DS Disks (10)	9.
2215	3 1/2" HD Disks (10)	15.
1581	DC2120	24.
2242	(50)	32.
2241	(50)	59.

2243	3 1/2" DS Color Disks (Qty. 10)	\$10.
2239	3 1/2" HD Color Disks (Qty. 10)	18.
Fuji 1/4" Data Cartridges call		
Sony ... lifetime		
3292	5 1/4" HD Disks (Qty. 10)	11.
3297	3 1/2" DS Disks (10)	9.
3298	3 1/2" HD Disks (10)	15.
8185	QD2040 Tape Cartridge	14.
1895	QD2120	21.
6715	QD6150	23.
1602	QD6250	29.

OUR POLICY

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- To order, call us Monday through Friday 8:00 a.m. to 1:00 a.m., or Saturday 9:00 a.m. to 5:30 p.m. Eastern Time. You can call our business offices at 603/446-3383 Monday through Friday 9:00 a.m. to 5:30 p.m.



IOmega ... 1 year
2224 Bernoulli II Transportable 90 MB—Rugged and built to last, this drive will absorb 1000 g's of shock and provide 90 MB of portable storage. Awards from Byte and InfoWorld. Requires adapter card \$799.

SHIPPING

Note: Accounts on net terms pay actual shipping.

Continental US:

- For heavy hardware items such as printers, monitors, Bernoulli Boxes, etc. pay actual charges. Call for UPS 2nd-Day & Next-Day-Air.
- For all other items, add \$3 per order to cover UPS Shipping. For such items, we automatically use Airborne Express at no extra charge if you are more than 2 days from us by UPS ground.

Hawaii:

- For monitors, printers, Bernoullis, computers, hard drives, and power backups, actual UPS Blue charge will be added. For all other items, add \$3 per order.

Alaska and outside Continental US:

- Call 603/446-0004 for information.



PC Parade.

**From Marlow to Main Street.
(Or, a decade of service to beat the band.)**

Back in July of '82, shortly after the introduction of the IBM-PC, we marched (to the beat of a different drummer, of course) smack dab into the middle of the PC marketplace. Our idea was simple—to sell add-ons and software exclusively for IBM personal computers. Our first warehouse was even simpler—a closet in a converted sawmill in the one-horse (or was that a moose?) town of Marlow, NH (pop. 542 at the time). Our goals were rather modest, too—we just wanted to be the fastest, most convenient, and most reliable source for PC products anywhere on Planet Earth.

Over the last ten years, we've

learned that our small-town values play pretty well across America. And that anything humans can do, our high-stepping raccoon mascots can do better. So as our first decade draws to a close, we'd like to thank all our customers for making it so successful. May it never rain on your PC parade!

We'll give you the shirt off our backs!

The Official PC Connection 10th Anniversary Shirt, that is. A collector's item that can be worn with pride and panache at road races, corporate volleyball games, and even user-group meetings. It's free to anyone who places an order of \$750 or more between now and June 30. Specify S, M, L, XL or children's.



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DATASTORM TECHNOLOGIES INC.

Procomm Plus

by Gary Berline

Procomm Plus is Datastorm Technologies' more muscular retail version of its popular *Procomm* shareware communications package. Now in Version 2.01, the retail product retains all the ease of use that made the shareware product so popular. And at \$129, its power comes at a remarkably affordable price.

Procomm Plus can readily handle corporate needs, but unlike *BLAST Professional*, *Relay Gold*, and other communications programs designed to work across platforms, it is not designed for mainframe communications. But *Procomm* remains a premier product for single-session asynchronous connections. On PC Magazine Labs' benchmark tests, *Procomm Plus* not only ran well beside tough challengers like *Crosstalk Mk.4* and *HyperAccess/5*, it bested *Mk.4* on the ASCII screen capture and Xmodem-1K tests and fared better than *HyperAccess/5* on our straight ASCII transfer.

Novices can pick up *Procomm Plus*, barely crack the manual, and easily find their way around the program. Installation is easy and, although the many fea-

tures in *Plus* can be customized, its well-chosen default settings make customization unnecessary for most users. The program includes over 200 modems on its setup menu.

Mnemonic Alt-key combinations give fast access to many functions. Pull-down menus are logically arranged and can be accessed by a mouse or a keyboard. The program also features mouse support in the installation routine and all selection windows.

COMMAND SCREEN

You can choose commands listed on a general help screen; the commands are clearly organized under the labels Communications, Setup, and Other Functions. Superb context-sensitive help offers a topic index that features scrolling and text searching.

The software limits you to one session on one line, but it does run under multitasking environments such as Windows and *DESQview*, which enable background transfers. Terminal mode offers a few DOS-like commands. There is a file directory and you can shell to the operating system without dropping your connection.

A searchable phone directory retrieves busy or unanswered numbers; it will redial from a circular queue. There's no limit on the number of dialing directories, each of which holds 200 entries that you can sort alphabetically by name, as well as by phone number, bps rate, total calls, or last call. Each entry can contain a wealth of assignments: COM port, log-on password, script file, among others.

Procomm Plus displays impressive versatility with 33 terminal emulations (including DEC VT-320), 15 transfer protocols, and the ability to add three external protocols. It supports modem or serial connections from 300 to 115,200 bps and possesses a variable-size redisplay buffer and strong screen handling. You can use your own utilities to replace the included editor, file viewer, or both by simply changing a setup menu.

A recording option will automate scripting in Aspect, a powerful C-like

FACT FILE

Procomm Plus, Version 2.01
Datastorm Technologies Inc., 3212 Lemone Industrial Blvd., Columbia, MO 65201; 314-443-3282, BBS 314-875-0503.
List Price: \$129.
Requires: 192K RAM (295K recommended), DOS 2.1 or later.
In Short: *Procomm Plus* gets top marks for ease of use. Datastorm Technologies blends an excellent dialing directory, a full complement of fast and robust protocol implementations, a long list of terminal emulations, and a bargain price.

CIRCLE 487 ON READER SERVICE CARD

language that provides wide program control. Aspect will also hook external code, allowing you to launch other programs. And its compiler will encrypt strings.

Datastorm provides *Plus* users with unlimited free, but not toll-free, voice support weekdays, 9:00 to 5:00 CST, and a CompuServe forum. Add that to the rest of the bundle and *Procomm Plus* remains the choice for individual and corporate communications where mainframe connectivity is not required.

OMEN TECHNOLOGY INC.

Professional YAM

by Rick Ayre

If you like windows, then Omen Technology's *Professional YAM*, Version 17.94, isn't for you. Written by Chuck Forsberg, the author of the Ymodem and Zmodem file-transfer protocols, *YAM* has the most cumbersome user interface we've seen. But if you want power and performance, and believe that nothing will replace a few well-chosen keystrokes for efficiency, *Pro YAM*, priced at \$139, is the communications package for you.

Pro YAM is a set of modular tools, an architecture inspired by the Unix operating system, and the Berkeley Editor (vi) in particular. Its install program copies the files to your hard disk. Period. After that, you are on your own. There is nothing to prompt you through the setup. And since you need to set DOS environment variables before you execute *Pro YAM*, you'd better read the manual.

Pro YAM's manual is a mixture of earthy, pragmatic suggestions and highly technical jargon. Chances are, the information you need is in there. So are state-



The *Procomm Plus* dialing directory shows a status line at the bottom that you can turn off if it gets in the way. The Toggle directory option allows you to see details of each entry's emulation, default protocol, statistics, and several other parameters, while the Exchange Dir option lets you call up any other phone list.

YES, WE DO.



With **THE LANTASTIC® FOR WINDOWS™ NETWORK STARTER KIT**, you get an intuitive Windows interface plus everything you need to network your first two PCs — software, hardware, cabling and clear, useful documentation. This kit features the newest version of the full-featured, easy-to-use LANTastic networking system, 4.1. And, by buying the kit instead of separate packages, **you save \$200.***

With Version 4.1, you get all the powerful features that have won the LANTastic system the *PC Magazine* Editors' Choice Award® for four years in a row:

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- ◆ DOS-based compatibility
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- ◆ Peer-to-peer flexibility

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- ◆ **Faster Printing** — immediate despooling and print notification
- ◆ **Even easier to use** — multiple server logins, menu hot keys, improved help

- ◆ **Enhanced System Management** — configure and manage network from one PC
- ◆ **Same Low Price** — making the LANTastic System even *more cost-effective*

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**LANTIMES
READERS
CHOICE
1992**

**PC
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April 14, 1992
LANTastic, Version 4.1



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COMMUNICATIONS COMMUNICATIONS SOFTWARE



SUMMARY OF FEATURES

Products listed in alphabetical order

—Editors' Choice
☒—Yes ☐—No

	BLAST Professional	COM-AND	Crosstalk for Windows	Crosstalk Mk.4	Crosstalk XVI
List price	\$169.00	\$50.00	\$195.00	\$295.00	\$195.00
SYSTEM REQUIREMENTS					
RAM required	350K	384K	150K	320K	120K
Program can run as TSR	☒	☐	☒	☒	☒
Program can load extended/expanded memory	☒	☐	☐	☐	☐
NETWORK SUPPORT					
Network version available	☒	☒	☒	☒	☒
Network version included	☒	☒	☒	☒	☐
INT 14 support	☒	☒	☒	☒	☐
NAI support	☒	☒	☒	☒	☐
TRANSFER PROTOCOLS SUPPORTED ON MENU					
Kermit/Kermit with sliding windows	☒	☒	☒	☒	☒
Xmodem-1K/Xmodem-G	☒	☒	☒	☒	☒
Ymodem batch/Ymodem-G batch	☒	☒	☒	☒	☒
CompuServe B/Quick B/B+	☒	☒	☒	☒	☒
Other	None	None	None	Hayes FAST,INDSFILE	None
Proprietary protocol	☒	☐	☒	☒	☒
External protocol installation and support	☐	☒	☐	☐	☐
SCRIPTING LANGUAGE					
Number of verbs	70	300	260	397	119
Auto-learn function	☒	☒	☒	☒	☐
Subroutine or function scripts	☒	☒	☒	☒	☐
COMMUNICATION SCRIPTS INCLUDED					
MCI Mail	☒	☐	☒	☒	☒
AT&T	☐	☐	☒	☒	☒
CompuServe	☒	☒	☒	☒	☒
Dow Jones	☒	☒	☒	☒	☒
PC MagNet	☐	☒	☐	☐	☐
Other	Delphi, EasyLink, GENie, Lexus/Nexus, NewsNet, Telnet, Tymnet	Genie, Unison	Delphi, GENie, Lexus/Nexus, NewsNet, OAG, Remote2, Vu/TEXT	Delphi, GENie, Lexus/Nexus, NewsNet, OAG, Remote2, Vu/TEXT	Delphi, GENie, Lexus/Nexus, NewsNet, OAG, Remote2, Vu/TEXT
HOST/MINI-BBS FEATURES					
Remote call-in security	☒	☒	☒	☒	☒
Callback feature	☒	☒	☐	☐	☐
Log calls	☒	☒	☒	☒	☒
Public messages	☐	☒	☐	☒	☐
PROGRAM FEATURES					
Number of predefined modem setup strings	32	10	60	60	60
Context-sensitive help screens	☒	☒	☒	☒	☐
Phone directory	☒	☒	☒	☒	☐
Number of directories	Unlimited	Unlimited	Unlimited	Unlimited	N/A
Number of entries per directory	Unlimited	100	Unlimited	Unlimited	N/A
Password security for local operation	☐	☒	☐	☒	☐
Menus	☒	☒	☒	☒	☐
Import/export ASCII phone book	☐	☒	☐	☒	☒
Uses own file compression	☒	☐	☒	☒	☐
User can shut off file compression	☒	N/A	☒	☐	N/A
User can incorporate text editor	☒	☒	☒	☒	☒
Text editor included	☒	☐	☐	☒	☐

N/A—Not applicable: The product does not have this feature.

COMMUNICATIONS
COMMUNICATIONS SOFTWARE

Dynacomm Asynchronous for Windows	HyperAccess/5	Microphone II for Windows	Mirror III	MTEZ	PereLine	Pilot	Procomm Plus	Professional YAM	Omodem
\$249.00	\$99.95	\$129.00	\$149.00	\$99.00	\$49.95	\$49.00	\$129.00	\$139.00	\$99.00
180K	368K	256K	480K	256K	220K	256K	192K	256K	384K
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
✓/✓	✓/✓	✓/✓	✓/✓	✓/✓	✓/✓	✓/✓	✓/✓	✓/✓	✓/✓
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
✓/✓	✓/✓	✓/✓	✓/✓	✓/✓	✓/✓	✓/✓	✓/✓	✓/✓	✓/✓
✓/✓	✓/✓	✓/✓	✓/✓	✓/✓	✓/✓	✓/✓	✓/✓	✓/✓	✓/✓
✓/✓/✓	✓/✓/✓	✓/✓/✓	✓/✓/✓	✓/✓/✓	✓/✓/✓	✓/✓/✓	✓/✓/✓	✓/✓/✓	✓/✓/✓
Yterm	None	None	Crosstalk, Hayes	None	None	None	TeleLink	Fido, Telelink, Zmodem-90	None
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
300	153	200	304	99	192	26	300	200	93
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
BIX, Delphi, GEnie	BIX, GEnie	BIX, GEnie	BIX, Delphi, Lexus/Nexus, OAG,	None	BIX, Dialog, Fido, GEnie, Opus	None	GEnie	BIX, GEnie	None
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
4	165	Unlimited	138	180	51	11	200	None	125
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
1	Unlimited	Unlimited	Unlimited	1	Unlimited	Unlimited	Unlimited	Unlimited	Unlimited
Unlimited	2,000	75	Unlimited	200	100	Unlimited	200	Unlimited	200
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
✓/✓	✓/✓	✓/✓	✓/✓	✓/✓	✓/✓	✓/✓	✓/✓	✓/✓	✓/✓
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
N/A	✓	N/A	✓	N/A	N/A	N/A	N/A	✓	N/A
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

CONTINUES



PowerBook

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It's not just a new computer.
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It's easy.

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PowerBook.



*The PowerBook 170 offers performance comparable to 20 MHz 486sx desktop PCs running Windows 3.0.***

Introducing the PowerBook™ computer from Apple. In a world filled with look-alike notebook computers, it's a powerful new alternative.

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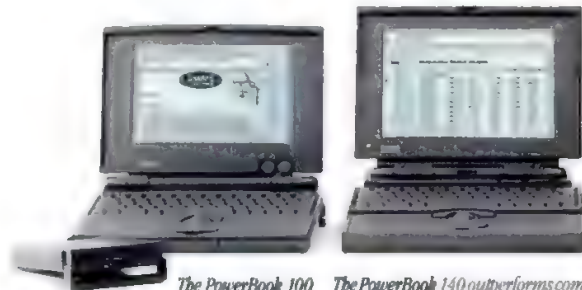
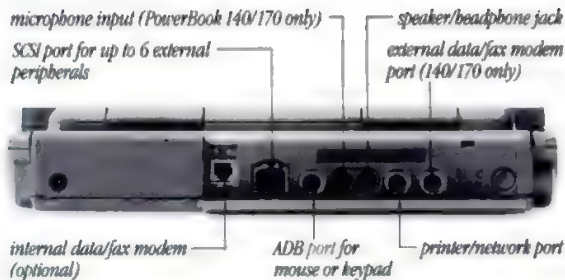
It comes in three powers: powerful, extremely powerful, and remarkably powerful.

Fortune magazine named it a "Product of the Year." It's the power to work anywhere you want, anytime you want, in whatever way works best for you. The power to be your best.*

The power to be your best.



write disk drive (it's standard on the PowerBook 140/170. An optional external version is available for the PowerBook 100.) **Comparisons are based on a Macintosh and Microsoft Windows 3.0 environments. ©1992 Apple Computer, Inc. Apple, the Apple logo, AppleTalk, Macintosh, and "The power to be your best" are trademarks of Apple Computer, Inc. SoftPC is a registered trademark of Insignia Solutions Inc. This ad was created using Macintosh computers.



The PowerBook 100 outperforms comparably configured 286 PCs running Windows 3.0.**

The PowerBook 140 outperforms comparably configured 16 MHz and 20 MHz 386sx PCs running Windows 3.0.**



The AppleTalk® Remote Access software (included) gives you access to your Macintosh personal computer via phone line – so you can use all your files or e-mail, or an entire AppleTalk network, from wherever you are.



A trackball and palm rests make the PowerBook extraordinarily comfortable for both left- and right-handed people to use.



PowerBook offers a new level of compatibility – its built-in Apple® SuperDrive™ disk drive reads from and writes to Macintosh and MS-DOS formatted disks. Add SoftPC and you can run MS-DOS programs, too. (You can even run MS-DOS and Macintosh programs at the same time.)

PowerBook	Weight	Memory	Hard Disk	SuperDrive	Processor	Internal Modem
100	5.1 lb.	2/4MB	20/40MB	Optional ext.	16 MHz 68000	Optional
140	6.8 lb.	2/4MB	40/80MB	Internal	16 MHz 68030	Optional
170	6.8 lb.	4MB	40/80MB	Internal	25 MHz 68030/68882 coprocessor	Optional

All PowerBook models expandable to 8MB RAM

For the name of your nearest authorized Apple reseller, call 800-446-3000, ext. 700. *To run MS-DOS, also needs a program like SoftPC and an Apple SuperDrive. **1991 independent research study conducted by Ingram Laboratories that tested a variety of personal computers running applications on both the Macintosh and Windows 3.0. MS-DOS is a registered trademark and Windows is a trademark of Microsoft Corporation.

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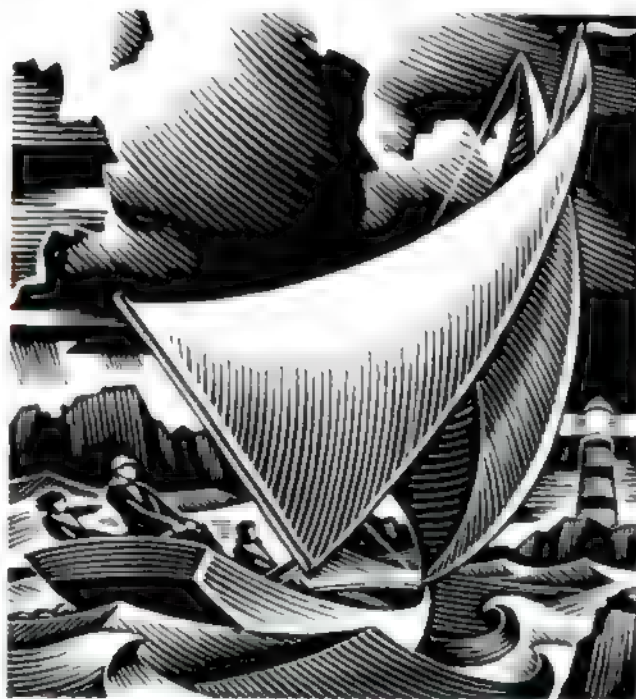
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Support On Site™

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2. How should you configure DESQview 386 to run with Lotus 1-2-3?
3. What causes a "Cannot load COMMAND.COM" message in DOS 5.0?

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FAST ANSWERS TO
SOFTWARE QUESTIONS



SUMMARY OF FEATURES

Products listed in alphabetical order



	Relay Gold for DOS	Relay Gold for Windows	Rexxterm	Smartcom Exec	Smartcom III	Telemate	Telix	Unicom
List price	\$299.00	\$399.00	\$75.00	\$129.00	\$199.00	\$45.00	\$51.00	\$70.00
SYSTEM REQUIREMENTS								
RAM required	192K	500K	250K	512K	512K	500K	256K	180K
Program can run as TSR	☒	☐	☐	☐	☐	☐	☐	☒
Program can load extended/expanded memory	☒	☒	☐	☒	☒	☒	☐	☒
NETWORK SUPPORT								
Network version available	☒	☐	☒	☒	☒	☐	☒	☐
Network version included	☒	☒	☒	☒	☒	☒	☒	☒
INT 14 support	☒	☒	☐	☒	☒	☒	☒	☐
NAI support	☒	☐	☐	☒	☒	☐	☒	☐
TRANSFER PROTOCOLS SUPPORTED ON MENU								
Kermit/Kermit with sliding windows	☒	☒	☒	☒	☒	☒	☒	☒
Xmodem-1K/Xmodem-G	☒	☒	☒	☒	☒	☒	☒	☒
Ymodem batch/Ymodem-G batch	☒	☒	☒	☒	☒	☒	☒	☒
CompuServe B/Quick B/B+	☒	☒	☒	☒	☒	☒	☒	☒
Other	None	None	None	None	None	None	TeleLink	None
Proprietary protocol	☒	☒	☐	☐	☐	☐	☐	☐
External protocol support/installation	☒	☒	☒	☒	☒	☒	☒	☒
SCRIPTING LANGUAGE								
Number of verbs	300	300	Unlimited	191	191	100	140	200+
Auto-learn function	☒	☒	☒	☒	☒	☒	☐	☒
Subroutine or function scripts	☒	☒	☒	☒	☒	☒	☒	☒
COMMUNICATION SCRIPTS INCLUDED								
MCI Mail	☐	☐	☒	☒	☒	☐	☐	☒
AT&T	☐	☐	☐	☒	☒	☐	☐	☐
CompuServe	☐	☐	☒	☒	☒	☐	☒	☒
Dow Jones	☐	☐	☐	☒	☒	☐	☐	☐
PC MagNet	☐	☐	☒	☐	☐	☐	☐	☐
Other	None	None	BIX	None	None	Fido, GENie, Phoenix, Sptire, TBBS, WVID	Fido, QBBS, TBBS	None
HOST/MINI-BBS FEATURES								
Remote call-in security	☒	☒	☒	☒	☒	☐	☒	☒
Callback feature	☐	☐	☐	☐	☐	☐	☐	☒
Log calls	☒	☒	☒	☐	☐	☒	☒	☒
Public messages	☐	☐	☐	☐	☒	☒	☐	☐
PROGRAM FEATURES								
Number of predefined modem setup strings	110	110	None	Unlimited	Unlimited	1	200	None
Context-sensitive help screens	☒	☒	☐	☒	☒	☒	☐	☒
Phone directory	☒	☒	☒	☒	☒	☒	☒	☒
Number of directories	1	1	Unlimited	1	1	Unlimited	Unlimited	500
Number of entries per directory	Unlimited	Unlimited	Unlimited	Unlimited	Unlimited	1,000	1,000	Unlimited
Password security for local operation	☒	☒	☒	☒	☒	☒	☒	☒
Menus	☒	☒	☒	☒	☒	☒	☒	☒
Import/export ASCII phone book	☒	☒	☒	☐	☒	☐	☐	☒
Uses own file compression	☒	☒	☐	☐	☒	☐	☐	☐
User can shut off file compression	☒	☒	N/A	N/A	☒	N/A	N/A	N/A
User can incorporate text editor	☐	☒	☒	☐	☐	☒	☒	☒
Text editor included	☒	☒	☒	☒	☒	☒	☒	☒

N/A—Not applicable: The product does not have this feature.

ENDS

COMMUNICATIONS COMMUNICATIONS SOFTWARE

MUSTANG SOFTWARE INC.

Qmodem

by Stuart R. Greenberg

ments like "If you seek a video arcade modem game, *Pro YAM* will disappoint you" and "Do not write on the distribution diskette unless a nuclear attack is in progress."

SCRIPTED MODULES

Pro YAM is a communications engine that also functions as a language interpreter for its line-oriented scripting language. All of your communications parameters and all of the comm functions are handled by individual modules. There is a module that handles port configuration, one that controls certain file transfers, and modules for most of today's popular high-performance modems.

To get *Pro YAM* working the way you want, you need to write or edit *Pro YAM* scripts in a structure like BASIC and a syntax like C. A bare-bones phone book

can be set up by answering prompts, but that is the exception rather than the rule. Still, *Pro YAM*'s scripting language is unusually powerful and a master can use it to work wonders.

Pro YAM is a workhorse. Omen has dramatically enhanced Zmodem's performance with its Zmodem-90 protocol. The differences show. Under our direct connect tests, *Pro YAM* flew by its competitors.

Despite its performance and flexibility, *Pro YAM*'s user interface makes it an application better suited for programmers than end users. If you hate mice, menus, and windows, few choices can compare.

*Qmodem's off-line
mail reader gives you a
unique way to cut
long-distance phone bills.*

Once a popular shareware program and now also sold as a commercial package, *Qmodem* packs ease of use into a powerful communications package.

Today, *Qmodem*, Version 5.0, can be purchased from Mustang Software for \$99. A shareware version of *Qmodem*, Version 4.5, is also available through the

usual shareware version one release behind the commercial product. Users who register their shareware versions of *Qmodem* now will be automatically upgraded to the com-

mercial version. Registered users of Version 5.0 can upgrade to Version 5.01 (released after our review period) via a patch available on the Mustang BBS.

Qmodem is easy to install. System files are copied into directories that the program created. Before running *Qmodem* for the first time, you run a configuration program, QSM.EXE, that enables you to pick from 125 popular modems. All QSM settings except memory management are available while running *Qmodem*. Context-sensitive help as well as complete documentation describing each setting are included.

Qmodem supports most of the major protocols except CompuServe B. *Qmodem* 5.0 also includes VT100, VT1925, AVATAR, and ANSI terminal emulations, and has added three more emulations—VT52, IBM 3101, and Heath/Zenith—in Version 5.01.

Dialing phone numbers is equally simple. A hotkey, Alt-D, brings up the phone book. *Qmodem* supports up to 200 phone numbers per phone book file, and as many phone books as you like. Once you enter the names and numbers of the systems you want to access, simply make a selection from this list and you are off and running. You can assign different entries to different COM ports or set an entry to use the default COM port. Any



FACT FILE

Qmodem, Version 5.0

Mustang Software Inc., P.O. Box 2264, Bakersfield, CA 93303; 800-999-9619, 805-395-0223, BBS 805-395-0650.

List Price: \$99.

Requires: 384K RAM, DOS 2.0 or later.

In Short: *Qmodem* 5.0 should have no problem making the transition from shareware to a commercial product. Although lacking a built-in CompuServe B protocol, *Qmodem* is otherwise rich in features. Its context-sensitive help facility and quick modem configuration for nearly 90 modems make the often-confusing world of data communications much easier to explore.

CIRCLE 488 ON READER SERVICE CARD

other commands you might need to know are on a single summary screen accessed by hitting the Home key.

Once connected to a system, *Qmodem* gives you a unique way to help cut down on long-distance phone bills, an off-line mail reader called OLX (Offline Express). With OLX you can dial up a BBS, download a compressed file of messages, and read and respond to them off-line. OLX should help *Qmodem* easily make the transition from shareware to commercial success.

MICROCOM INC.

Relay Gold for DOS

by Gary Berline

Microcom's *Relay Gold for DOS*, Version 5.0, delivers an industrial-strength solution for mainframe communications. But with an awkward interface and a \$299 list price, it is more for corporate environments than for lightweight communications.

Relay Gold's installation is pretty easy. A simple but effective batch utility lets you automate repetitive installations, making this package especially appealing for corporate managers. The utility lets you retrieve setup information from a parameter file instead of responding to queries each time you install the program.

Initialization strings for more than a hundred modems are included with the package. If your modem isn't supported, however, writing a special initialization string can be a difficult process since you need to use a script.

Once you've got the modem and *Relay Gold* talking, you'll find that the dialing



FACT FILE

Professional YAM, Version 17.94

Omen Technology Inc., P.O. Box 4681, Portland, OR 97208; 503-621-3406.

List Price: \$139. Versions are also available for OS/2, various Unix flavors, and VMS at the same single-user price.

Requires: 256K RAM, DOS 2.0 or later.

In Short: A workhorse program with outstanding performance that relies on a powerful scripting language, *Professional YAM*'s interface is bare bones and made for users who are serious about communications.

CIRCLE 489 ON READER SERVICE CARD

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Backed By Certified NetWare® Engineers.



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- EISA bus with eight 32-bit expansion slots: six bus master; two slave
- 1.2MB 5.25" and 1.44MB 3.5" floppy drives
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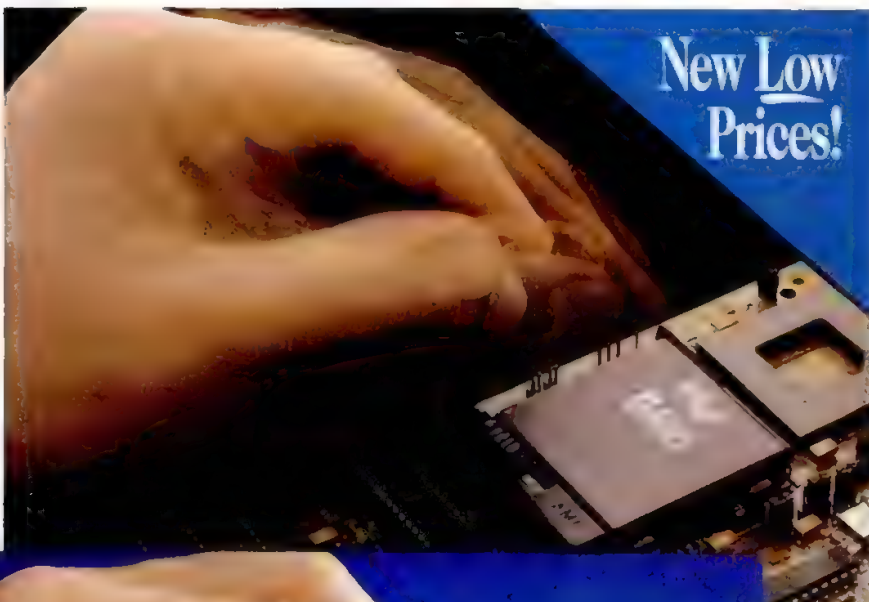
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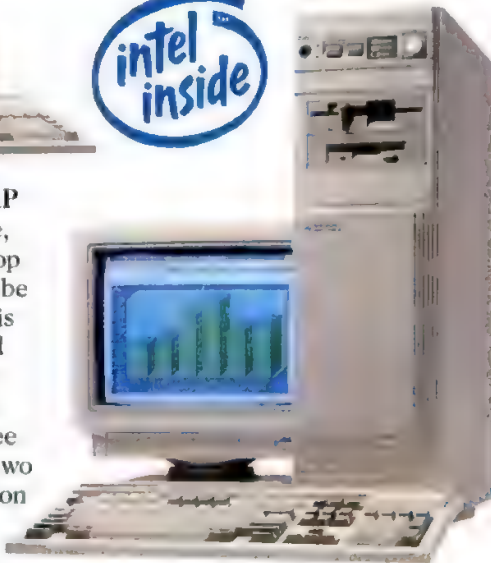


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To get all the advantages of ZXP technology and conserve space, Northgate's space saving desktop case is your solution. But don't be misled by its compact size. This system delivers pure power and has seven expansion slots. Features a whisper-quiet 200 watt power supply and room for three exposed 5.25" half-height and two exposed 3.5" devices – expansion is a breeze!

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PERFORMANCE TESTS

Reliability, scripting, ease of use, and the user interface—not speed—account for the real differences in communications software. Speed differentiates proprietary protocols, where products like *BLAST Professional* and *HyperAccess/5* shine.

WHAT THE NUMBERS MEAN

All the DOS-based communications packages performed about the same on our tests. Windows and non-Windows products showed differences because, with the exception of *Microphone II for Windows* and *Unicom*, the Windows packages were unable to exceed 19.2 kilobits per second, a far cry from the 57.6 Kbps typical of the DOS packages.

When capturing an ASCII file to disk, the critical factor is not performance as much as reliability, as shown by our Screen Capture to Disk test. *Rexxterm* and *Pilot* were fastest, but *Pilot* corrupted the files it transferred over the 57.6-Kbps connection in our first three tests.

Zmodem support was a problem. Although all products supported some

subset of Zmodem, not all provided all features. *Crosstalk*, *Microphone II*, *PereLine*, *Pilot*, *Relay Gold*, and *Rexxterm*, for example, did not offer a Zmodem line-error recovery feature. On the Zmodem Interrupt test, where a file transfer is interrupted, these packages had to resend the entire file.

Only *BLAST Professional*, *COM-AND*, *Crosstalk XVI*, *PereLine*, *Professional YAM*, *Smartcom Exec*, and *Smartcom III* supported Zmodem's date code feature, which prevents an older version of a file from overwriting a newer one. Some vendors argue that this Zmodem feature should be included as an option in every package.

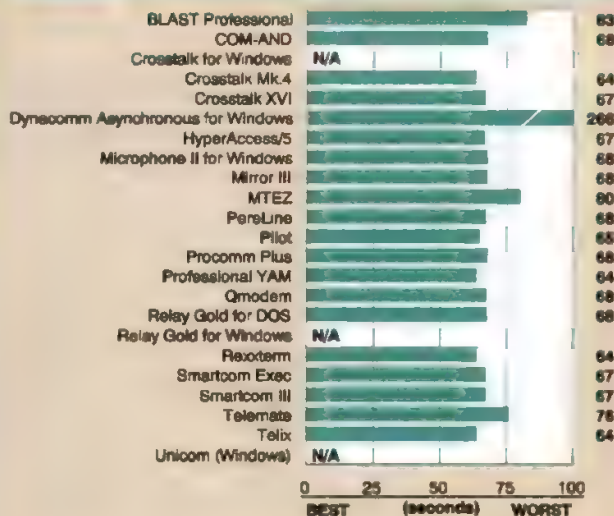
Proprietary protocols make a big difference. The best protocols we saw use a combination of a sliding windows algorithm, compression, and bidirectional communication. *HyperAccess/5's* HyperProtocol, for example, achieved its impressive 83-second transfer time with our 1MB file by handling files more efficiently than standard protocols do.

Different techniques gave *BLAST Professional*, *Crosstalk Mk.4*, and *Relay Gold for DOS* their impressive performance on our Proprietary Protocol test. *BLAST* uses bidirectional communications and a sliding windows protocol. Sliding windows let you transfer more data before receiv-

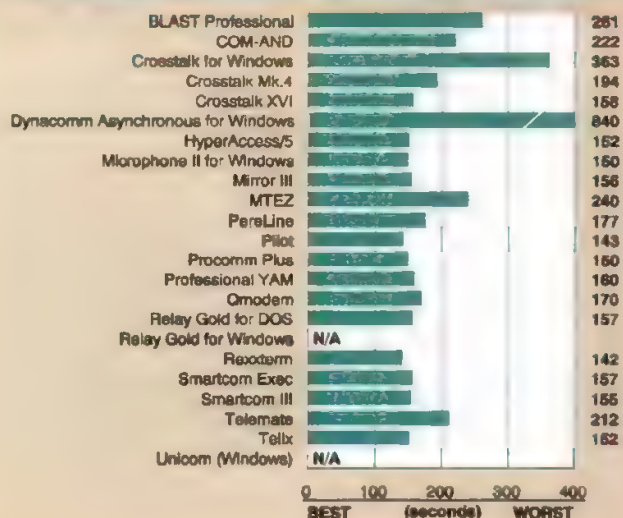
ing an acknowledgment from the host. By contrast, both *Crosstalk Mk.4* and *Relay Gold* used relatively efficient compression algorithms to get their performance boost.

For raw transfer speed based on the original Zmodem specification (our 115K High-Speed Transfer test), *Procomm Plus*, *HyperAccess/5*, *Smartcom Exec*, *Smartcom III*, and *Crosstalk XVI* were all impressive. *Professional YAM* was nearly three times as fast as the others, but it had an advantage: Since the sending and receiving PCs were both running *Professional YAM*, they could employ some of the Zmodem-90 enhancements, such as compression. Other packages may also offer compression in their Zmodem implementations, but they would have been unable to employ the Zmodem-90 features since they were communicating with *Professional YAM* and not a host running the same application. *Microphone II*, *MTEZ*, *Relay Gold for DOS*, *Relay Gold for Windows*, *Telnet*, and *Unicom* could connect to the control station running *Professional YAM* but could not complete the transfer. *Relay Gold for Windows* did not complete several other tests as well.

SCREEN-TO-SCREEN BUFFER CAPTURE

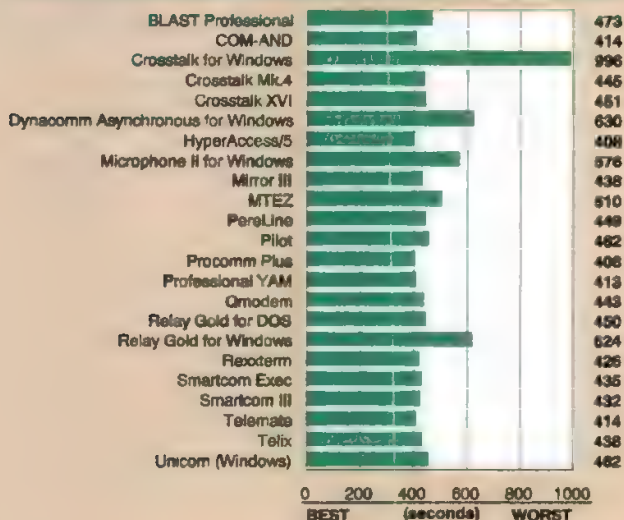


SCREEN CAPTURE TO DISK



N/A—Not applicable: The product could not complete this test.

XMODEM-1K TRANSFER



HOW WE TESTED

We tested all the packages using two AT&T Comsphere 3810 modems with hardware flow control enabled. Each modem was attached to a Hayes Enhanced Serial Port (ESP) board inside a Compaq Deskpro 386/25e. The 16550AFN UART buffer in the Hayes boards enhanced all the packages' performance, but we disabled the ESPs' additional buffers to avoid skewing test results toward programs that specifically support them.

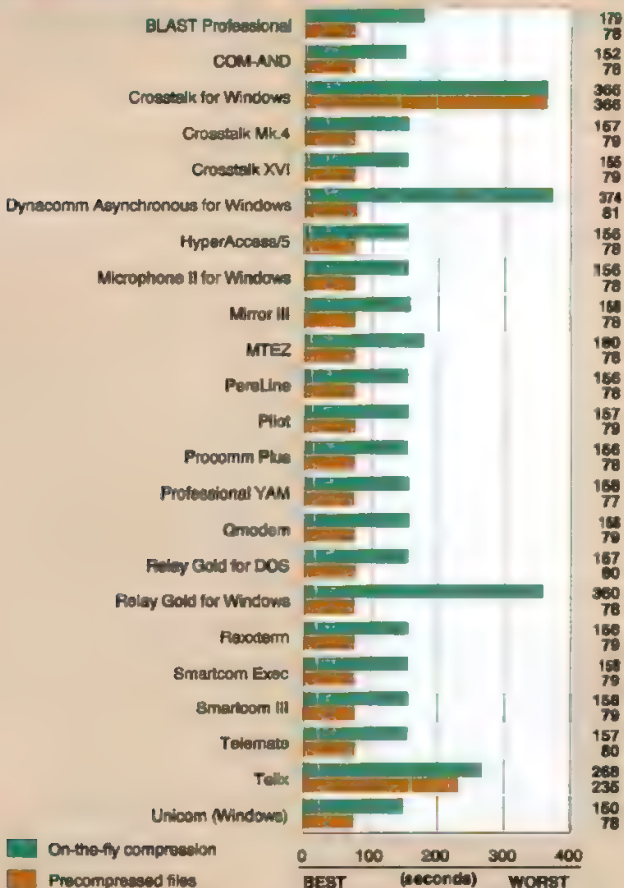
The host PC, acting as a dial-up source, was running *Professional YAM*. We chose this software because of its scripting ability and its robust Zmodem implementation, known as Zmodem-90.

All files used during the transfer were set for read-only access to protect the integrity of the host files. We tested all products in the same manner except that we used different protocols (and different software on the host) for the Proprietary Protocol test.

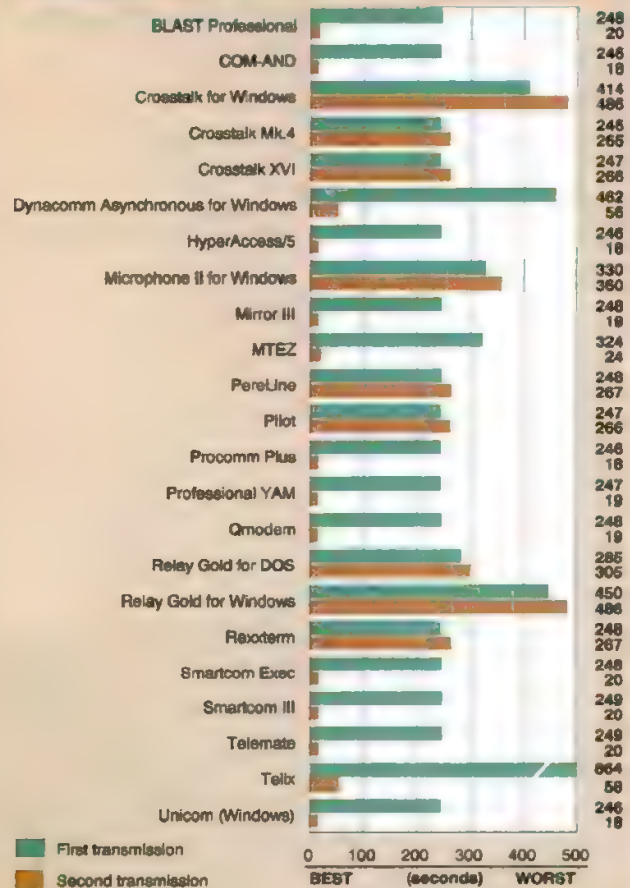
We ran each test three times, normally using the *Professional YAM* script to measure the timings, and we then averaged the results. The Screen-to-Screen Buffer Capture test required a stopwatch, since the video buffer may add extra time that the software does not detect.

We did not test *Crosstalk Communicator*, *Terminal Plus*, and *Microcourier* because they are essentially the same as *Crosstalk Mk.4*, *Dynacomm Asynchronous for Windows*, and *Relay Gold for Windows*, respectively.

ZMODEM TRANSFER



ZMODEM INTERRUPT



CONTINUES

PERFORMANCE TESTS

The **Screen-to-Screen Buffer Capture** (or ASCII Text Uploading) test illustrates the package's control over a modem by timing the transfer of a 69K ASCII file from the client's screen to the host's screen.

The **Screen Capture to Disk** test is the same as the Screen-to-Screen Buffer Capture test except that it captures and stores a file to the calling PC's hard disk. Some packages were unable to capture data to a hard disk while accurately displaying the file on the screen.

The **Xmodem-1K Transfer** test measures the software's ability to support a standard protocol. The host, running *Professional YAM*, sends a 1MB file to the remote PC. The transfer time is measured and the received file checked for accuracy.

The **Zmodem Transfer** test evaluates the software's Zmodem implementation by executing eight file transfers from the host to remote PCs. We report two timings. The first score—the average time for the first six transfers—indicates Zmodem's ability to compress an ASCII file. The second score—the average time for the last two tests—reflects Zmodem's ability to recognize a precom-

pressed file. In both cases, large numbers indicate poor implementation of Zmodem's compression ability.

The **Zmodem Interrupt** test looks at support for Zmodem's ability to recover from an aborted file transfer and resume at the point where it stopped. We transmit 90 percent of a file, interrupt the transfer, and send the file again. If on the second part of the test the product transmits only 10 percent of the file, then it handles interrupted transfers efficiently.

The **Zmodem Date Code** test determines whether the product takes advantage of Zmodem's ability to discriminate between files based on their dates. We send three versions of a file; the third has an earlier date than the second one. If the third file overwrites the second file, the product does not support this feature.

The **Proprietary Protocol** test transfers a 1MB file from the host to the remote PC using the package's proprietary protocol. For this test, the host runs the product's own software, not *Professional YAM*.

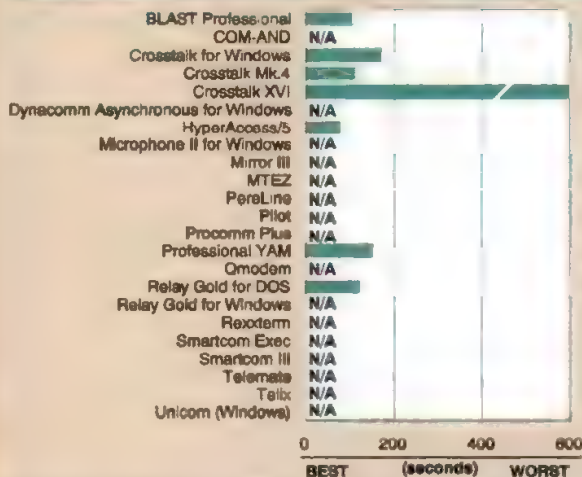
The **115K High-Speed Transfer** test looks at

the product's capacity to transfer data across a 115,200-bps serial link, which currently is not supported by modems. We use a null-modem cable to connect host and remote PCs and transfer a 1MB file.

ZMODEM DATE CODE

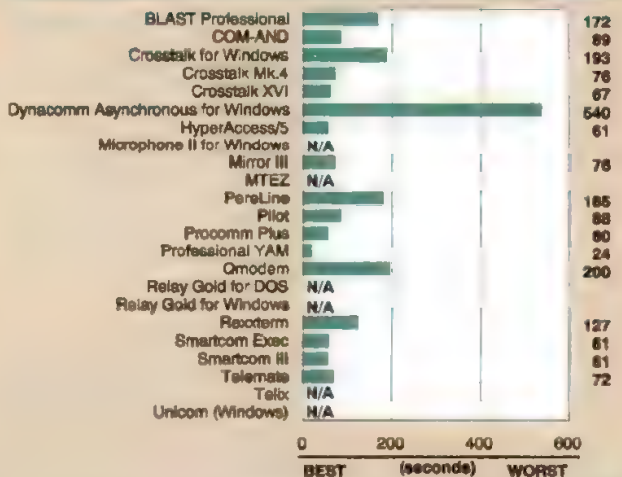
BLAST Professional	Pass
COM AND	Pass
Crosstalk for Windows	Fail
Crosstalk Mk 4	Fail
Crosstalk XVI	Pass
Dynacomm Asynchronous for Windows	N/A
HyperAccess 5	Fail
Microphone II for Windows	N/A
Mirror III	N/A
MTEZ	Fail
PereLine	Pass
Pilot	Fail
Procomm Plus	Fail
Professional YAM	Pass
Qmodem	Fail
Relay Gold for DOS	Fail
Relay Gold for Windows	N/A
Rexxterm	Fail
Smartcom Exec	Pass
Smartcom III	Pass
Telemate	Fail
Telix	Fail
Unicom (Windows)	Fail

PROPRIETARY PROTOCOL



N/A—Not applicable: The product could not complete this test.

115K HIGH-SPEED TRANSFER



ENDS

directory has plenty of room for your phone numbers. *Relay Gold* can accommodate an unlimited number of entries. They can be sorted only alphabetically by name, however.

VARIOUS PLATFORMS

Relay Gold's added value is its ability to handle cross-platform asynchronous communications. Connect to a host running *Relay3270* (a separate package) and you gain 3270 emulation without special hardware. Access a mainframe

running the appropriate flavor of *Relay/transfer* (also a separate package) and you acquire error-free file-transfer capabilities. This versatile communicator supports coax 3270 emulation boards in CUT (Control Unit Terminal) or DFT (Distributed Function Terminal) modes. It will also connect through protocol converters and gateways. Microcom now includes direct Token-Ring 802.2 support, previously an extra-cost item. Background operation, INT 14 support, and the ability to juggle multiple sessions (theoretically

up to 15) add even more value.

Relay, Microcom's own protocol, provides end-to-end error-free bidirectional transfers. Unlike protocols that provide error control only from modem to modem, it addresses errors that occur between your modem and your PC. Although differences in performance on PC Labs performance tests were comparatively slim, *Relay* came in with faster speeds than the other protocols on our Proprietary Protocol test.

The full-featured scripting language

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We Bring You Yet Another
Unbelievable Act
Of Lowness.



*To Bruno Zehnder and Heather May goes the prize
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below ground, in Antarctica, at 15° F below zero.*

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- FCC Class B certification



24

HOUR

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Notebook	CPU	RAM (MBs)	HD (MBs)	Battery Life (hrs)	Price
386SXL/25	386SXL-25 MHz Optional 80387SX	2 standard 4 & 6 options	60	3+	\$1,599 \$59/mo*
386SL/25	Intel 80386SL-25 MHz 64 K CPU cache Advanced SL power mgmt Optional 80387SX co-processor	2 standard 4 & 6 options	80	3+	\$1,999 \$74/mo*
486SX/25	Intel 80486SX-25 MHz Built-in 8K CPU cache	4 standard 8 & 20 options	80	2.5+	\$2,499 \$93/mo*
486DX/33	Intel 80486DX-33 MHz Built-in 8K CPU cache	as above	130	2.5+	\$2,999 \$111/mo*

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Desktop	CPU	RAM (MBs)	HD (MBs)	Floppy	Display	Price
386SX/25	Intel 80386SX-25 MHz	1 standard 32 max	40	1.2 or 1.44	16 bit SVGA card 14" 640x480 VGA Color Monitor	\$899 \$33/mo*
386SX/25	Intel 80386SX-25 MHz	1 standard 32 max	80	as above	as above	\$999 \$37/mo*
386DX/33	Intel 80386DX-33 MHz	2 standard 32 max	80	1.2 & 1.44	16 bit SVGA card 14" 1024x768 SVGA Color Monitor	\$1,299 \$48/mo*
386DX/33 CACHE	Intel 80386DX-33 MHz 32K CPU cache	4 standard 32 max	120	as above	16 bit SVGA card w/ 1MB video RAM & 32,000 Color Support 14" 1024x768 SVGA Non-interlaced Color Monitor	\$1,699 \$63/mo*
486DX/33 CACHE	Intel 80486DX-33 MHz 128K CPU cache	4 standard 64 max	120	as above	as above	\$1,999 \$74/mo*
486DX2/50 CACHE	Intel 80486DX2 50 MHz 128K CPU cache New Double Clock CPU	4 standard 64 max	210	as above	as above	\$2,499 \$89/mo*

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4/14/92
LANtastic
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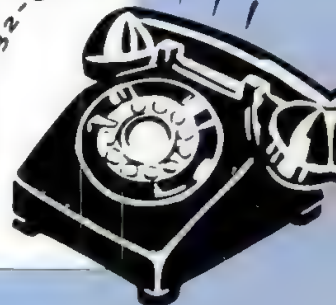
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- FCC Class B certification



Model	CPU	RAM (MBs)	HD (MBs)	Display	Price Inc. Software
3SX/25	Intel 386/SX-25 MHz	4	80	640x480 Resolution 52 14" VGA Color Monitor	\$1,299 \$48/mo*
3DN/25	Intel 386/DX-25 MHz	4	120	1024x768 Resolution 28 14" SVGA Color Monitor	\$1,699 \$48/mo*
4DX/33	Intel 486/DX-33 MHz 128K Aux. cache	8	210	1024x768 1MB video RAM 28 14" Non-interlaced Multisync Color Monitor	\$2,599 \$96/mo*

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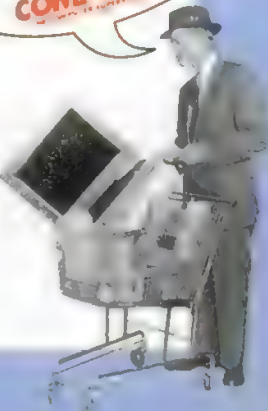
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FACT FILE

Relay Gold for DOS, Version 5.0

Microcom Inc., 55 Federal Rd., Danbury, CT 06810; 203-798-3830.

List Price: \$299.

Requires: 192K RAM, DOS 2.0 or later.

In Short: A powerful but expensive product, *Relay Gold for DOS* earns its keep in organizations with heavy requirements for communication between micros and mainframes. Microcom needs to flatten some rough spots, especially in *Relay Gold's* interface and slow proprietary Relay protocol.

CIRCLE 480 ON READER SERVICE CARD

offers command tracing to assist debugging and it now integrates the *Relay Gold* Toolbox, which was previously sold separately. The Toolbox provides panel (screen) management. An excellent editor works with text or hex and includes a macro facility.

Microcom provides free voice support via a toll number, 9:00 to 5:30 EST weekdays, and also runs a 24-hour BBS.

Reasons to look at *Relay Gold* grow with your need to link to disparate platforms. Those who come from a mainframe background will feel at home with the product, but Microcom should smooth a few rough spots for PC users.

MICROCOM INC.

Relay Gold for Windows Microcourier

by John R. Quain

Staking its DOS reputation in the Windows world, Microcom's *Relay Gold for Windows*, Version 5.0A, faces some stiff competition. With a list price of \$399, *Relay* is perhaps the most ungainly Windows communications package available. But its extensive terminal emulations and 3270 support mean IBM mainframe managers won't complain.

Rather than following the Windows icon conventions, *Relay* makes a conscious effort to remain consistent with the old *Relay* interface. Newcomers, however, may find it mystifying at times.

A single directory houses all scripts. The list is a mix of mainframe host connections, special terminal emulations, and predefined BBS scripts. *Relay* includes nine scripts for on-line services, including CompuServe, Dow Jones, and NewsNet.

The advanced options menu allows you to link your own scripts to the dialing file. *Relay* supports dynamic data exchange (DDE) and uses a procedural scripting language with 300 verbs, easily robust enough for such purposes.

Relay offers a proprietary bidirectional protocol in addition to the standard suite of protocols. There's also a thorough list of predefined modem setup strings with over 110 selections to choose from. An advanced settings menu enables you to select port parameters, character settings, the number of scroll-back screens (up to 32), and terminal emulation. *Relay* comes with terminal support for more than a dozen systems, including IBM 3101, DEC VT220, Adds Viewpoint, Hazeltine 1410, and TeleVideo 910.

The program's main attraction is its much-touted IBM 3270 support. It makes for easy connection to the company computer via either a 3270 emulation board, protocol converter, coaxial connection, or standard phone line. The program includes 3287 printer support and the ability to run multiple sessions concurrently, but it requires that the mainframe have Microcom's *Relay/3270* software installed. Network coverage is provided via INT 14 support, and the package can run on an IBM Token-Ring LAN or through Eicon 3270 gateways.

Like most of the other packages facing PC Labs' Zmodem Interrupt test, *Relay* failed to append updated file information. It did, however, automatically initiate Zmodem transfers without any user intervention.

One unusual and helpful feature is a tear-away status line that can be moved anywhere on your desktop so that transfers can occur in the background with only the status line visible. Furthermore, *Relay* retains a list of the last four calls you've made and displays them in the Connections file menu. You can just click on them to reconnect.

You can also minimize, move, or resize its windows, even when dialing. You cannot, however, make menu selections or do anything else within the program while a connection is being made.

Users who don't require the 3270 mainframe connectivity of *Relay Gold for Windows* but want a GUI version of *Relay* should consider *Microcourier*. The package lists for \$99 and includes all the protocol and terminal support of its big brother.

FACT FILE

**Relay Gold for Windows, Version 5.0A
Microcourier, Version 1.0A**

Microcom Inc., 55 Federal Rd., Danbury, CT 06810; 203-798-3830.

List Price: *Relay Gold for Windows*, \$399; *Microcourier*, \$99.

Requires: For *Relay Gold*, 620K RAM, Microsoft Windows 3.0 or later; for *Microcourier*, 600K RAM, Microsoft Windows 3.0.

In Short: Users familiar with previous DOS versions of *Relay Gold* will feel at home in the new Windows release. First timers will wonder why the program doesn't take better advantage of the Windows environment.

CIRCLE 481 ON READER SERVICE CARD

It also comes with some additional preset icons for launching connections, but it still contains much of *Relay Gold's* awkwardness.

There's no doubt that *Relay Gold for Windows* is one of the best Windows solutions for companies in need of 3270 support. And if you've already got *Relay VM*, *TSO*, or *CICS* on your mainframe, this choice makes sense. It's just unfortunate that Microcom didn't decide to change the program's interface for better Windows control.

QUERCUS SYSTEMS

Rexxterm

by Jonathan Matzkin

Rexxterm, Version 2.3, from Quercus Systems, brings the power of the Personal Rexx scripting language to communications software.

Priced at \$75, *Rexxterm* is a bit short on features, such as host mode operation. Greater functionality can be gained by adding the \$150 Rexx Interpreter. The two are also sold bundled together for \$200.

The program is primarily command line driven. A limited menu system and shortcut keys are also available.

Rexxterm did poorly on the ASCII Transfer test, and several of the other Protocol Transfer tests produced errors as well. *Rexxterm* did reliably transmit files at speeds up to 19,200 bps. But *Rexxterm's* lack of 115,200-bps support meant it had to be tested at lower speeds in a direct-connect environment. Support is available through a 24-hour BBS or a toll-free call.

Rexxterm's biggest selling point is its



FACT FILE

Rexxterm, Version 2.3

Quercus Systems, P.O. Box 2157, Saratoga, CA 95070, 408-867-7399, BBS 408-867-7488.

List Price: \$75; with Personal Rexx interpreter, \$200.

Requires: 250K RAM, DOS 2.0 or later.

In Short: *Rexxterm* allows access to the powerful Personal Rexx programming language, which gives it unusually powerful scripting capabilities. Its interface and its problems with 57,600-bps operation are drawbacks, however.

CIRCLE 492 ON READER SERVICE CARD

ability to work in conjunction with the Personal Rexx language. But programmers who consider it for communications should also consider its somewhat idiosyncratic interface and problems with high-speed operation.

HAYES MICROCOMPUTER PRODUCTS INC.

Smartcom Exec

by M. Keith Thompson

Hayes' *Smartcom Exec* is a light version of Hayes' *Smartcom III*, offering great performance wrapped up with terminal emulation, file-transfer protocols, a full-featured text editor, and a complete scripting language. At \$129, *Smartcom Exec* 2.1A, offers a reasonable combination of features, price, and performance.

Exec's user interface combines function keys and easy-to-understand menus. Context-sensitive help is available via the F1 key. Phone book entries contain the modem speed, communications port number, terminal type, and protocol settings associated with each remote system. However, the entries do not have separate download directories. A text editor util-

izes the function keys and menus. You can't substitute your favorite word processor for this editor.

Like *Smartcom III*, *Smartcom Exec* uses the SCOPE scripting language. SCOPE is a procedural line-oriented programming language, somewhat like BASIC. It includes variables and logic functions, and Hayes includes sample scripts.

Exec includes most file-transfer protocols, although CompuServe B is surprisingly absent. On our tests, *Exec*'s Zmodem file-transfer times were impressive. Hayes' implementation of Zmodem supports the protocol's auto start and recovery features.

Like *Smartcom III*, *Exec* is great for working across a LAN. It can work with modems located on a Novell *NetWare*, *LAN Manager*, and NetBIOS LAN thanks to support for INT 14, as well as NASI, NCSI, BAPI, and NETCI.

Hayes offers free technical support from 8:00 to 6:00 EST, Monday through Friday, and a 24-hour BBS.

Smartcom Exec is not recommended for novices with non-Hayes modems because it only sets up modems with Hayes commands. But in Hayes-compatible environments, its excellent networked modem support is attractive. International customers will appreciate the five-language version that's available.

HAYES MICROCOMPUTER PRODUCTS INC.

Smartcom III

by Steve Rigney

It's not surprising: If you have a Hayes modem, Hayes' *Smartcom III*, Version 2.0A, might just be for you. Priced at \$199, *Smartcom III* supports a number of file-transfer protocols, includes a powerful scripting language, a built-in text editor, and support for the Hayes ESP serial card. Context-sensitive help keys and pop-up menus contribute to the product's overall ease of use.

Installation is a breeze. *Smartcom* automatically scans Hayes modems and creates a setup string. With non-Hayes modems, however, it queries the modem to see if it supports the Hayes AT command set, as most modems do. If your modem needs a special setup string, you'll



FACT FILE

Smartcom III, Version 2.0A

Hayes Microcomputer Products Inc., P.O. Box 105203, Atlanta, GA 30348; 800-348-3221, 404-840-9200.

List Price: \$199.

Requires: 512K RAM, DOS 2.0 or later.

In Short: *Smartcom III* is a great communications program, especially if you have a Hayes or Hayes-compatible modem. Its powerful scripting language and well-designed menu system allow you to create sophisticated unattended connections. Novice and experienced users will find it a good choice in communications software.

CIRCLE 494 ON READER SERVICE CARD

need to create a setup profile manually.

Once installed, Hayes makes *Smartcom* simple to use with a special BBS dubbed "On-line With Hayes." The BBS, accessible through a special script, is a valuable learning tool for first-time users.

Smartcom III runs over *NetWare* and 3Com LANs and supports both INT 14 and NASI. Terminal emulation for ANSI, TTY, VT102, Prestel, and Teletel (Prestel and Teletel are European information systems) is also a standard feature.

Smartcom III fared well on PC Labs file-transfer tests. It fell in the middle of the pack in our Zmodem, Xmodem, and straight ASCII text testing.

SCOPE SCRIPTS

SCOPE (Simple Communications Programming Environment), *Smartcom III*'s scripting language, is a powerful tool for creating sophisticated applications. A table of command statements, included with the script editor, reduces the time needed to create a complicated script. The program also includes a learn mode.

Hayes includes sample scripts for connecting to AT&T Mail, CompuServe, and other services. Along with the scripting editor, you get an ASCII text editor for creating messages. You cannot substitute your favorite text editor, but you can edit and send previously created ASCII messages.

An interesting and convenient feature is international communications support. Using international modules, you can customize your keyboard, screen, and printer for use with German, French, and other Western European languages.

Hayes offers free technical support from 8:00 to 6:00 EST, Monday through Friday. A toll-free BBS is available 24 hours a day.



FACT FILE

Smartcom Exec, Version 2.1A

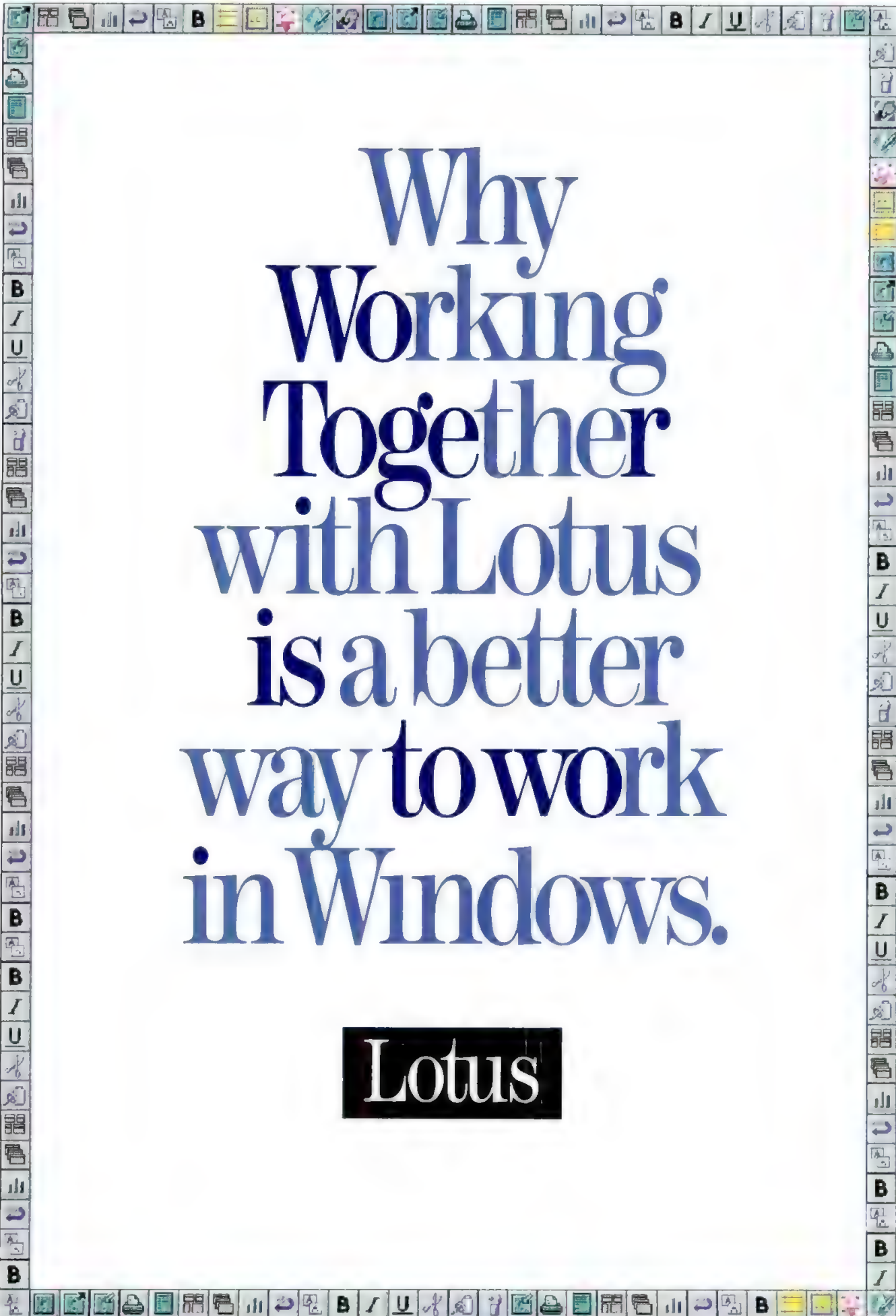
Hayes Microcomputer Products Inc., P.O. Box 105203, Atlanta, GA 30348; 404-840-9200.

List Price: \$129

Requires: 512K RAM, DOS 3.0 or later

In Short: *Smartcom Exec* combines easy-to-use features with a powerful scripting language to handle most communications needs. *Smartcom Exec* is ideal for Hayes-compatible modems.

CIRCLE 493 ON READER SERVICE CARD



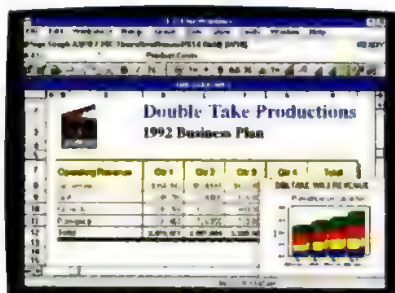
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Together
with Lotus
is a better
way to work
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Lotus

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If you're working in Windows,[™] you can now work better, faster and easier...with products from Lotus Development Corporation.

For one thing, our Windows applications are fully-integrated in look, feel and functionality. Fully compatible with each other. Mail-enabled with cc:Mail.[™] And unique in offering common features such as our revolutionary SmartIcons[™] which give you one-click access to your most frequent tasks.



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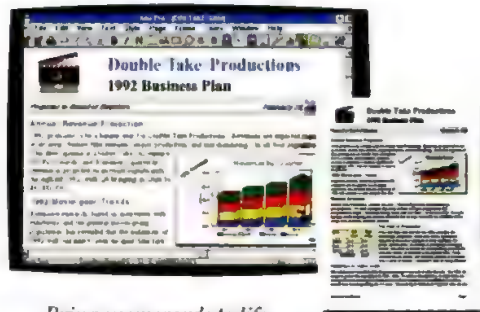
the slash (/) key. You'll even find complete compatibility with previous versions of 1-2-3. As well as versions of 1-2-3 that run on different platforms.

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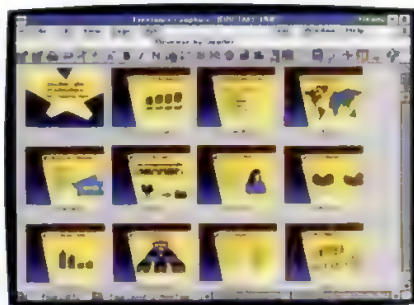


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the design you like, follow the on-screen prompts and fill in the blanks with text and graphics. It's that easy. So easy, in fact, that it recently beat Harvard Graphics in a one-on-one performance shoot-out (PC Week, 4/13/92).



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SmartSuite.

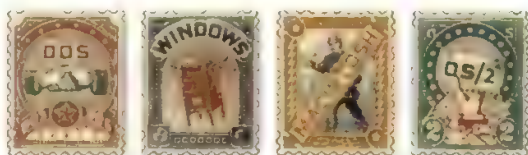
The best way to get it all together.

If you're looking for a complete solution in Windows, you needn't look further than SmartSuite.™ You get four individually outstanding Lotus applications...1-2-3, Ami Pro, Freelance Graphics and cc:Mail, our award-winning electronic mail program...all in one package. All for less than the price you'd expect to pay for two.

So whether you're buying for the first time or upgrading to SmartSuite from an existing Lotus application, this package represents one great deal. And one smart choice.

People working together

Staying competitive. It's the greatest single challenge your company faces in the days ahead. How can you do more with less? What will it take to get you there before the competition? How quickly can you service the new business you've



cc:Mail allows you to send messages transparently across all these platforms.

recently won? These are just some of the questions.

The answers lie in networks. And with people. Because for a business to truly be competitive, the people who work there need to be connected and coordinated.

Which is why more and more people are once again turning to Lotus, where they're discovering a collaborative form of computing that allows "connected" people and their ideas to come together. Whether it's sending a mail message to an associate using cc:Mail or conducting a global brainstorming session with Lotus Notes®, only Lotus offers you the products and expertise to make it all work together. No matter what network you're working on.

cc:Mail. The undisputed leader in electronic mail.



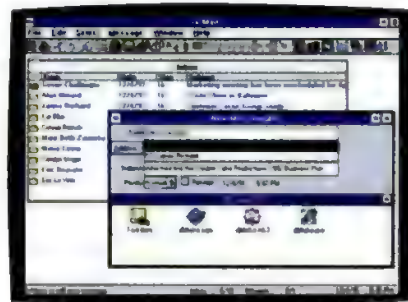
No one delivers a more powerful and flexible electronic mail package than cc:Mail from Lotus.

With it you can send text, graphics, faxes and entire files across all major LANs. And it runs transparently across DOS, Windows, Macintosh®, and OS/2®.



What's more, cc:Mail allows you to send files from within any mail-enabled Windows application, including 1-2-3, Ami Pro and Freelance Graphics. All without leaving the application.

Plus, cc:Mail is the first package of its kind to take advantage of a new, fully scalable messaging architecture. This means cc:Mail will grow along with your business. Whether you're adding five new users or 500,000.



When you consider all it delivers, it's easy to see why cc:Mail is the world's leading e-mail package.

her across networks.



itate information sharing. And to deploy them to multiple users at multiple sites in less time and for less money. Regardless of what networks, applications and operating systems are in place. For example, Notes runs on the most popular networks,



Notes makes group collaboration easier than ever before.

Considering all that it delivers, it's not surprising that cc:Mail won InfoWorld's 1991 Product of the Year Award. And that more than a million and a half people (and over 40% of the Fortune 500)* are counting on it to get their messages across. Maybe you should, too.

Lotus Notes. The only environment where people can truly collaborate.



Lotus Notes is more than a single application. It's a breakthrough technology that is solving real business problems by helping companies tap the collective expertise within their organizations. Not to mention making better use of their existing hardware, software and network investments.

This flexible, workgroup computing environment allows IT or MIS professionals and end users to work together to create the widest variety of applications that facil-

such as Novell®, IBM®, Microsoft®, DEC™ and Banyan®. And in Windows and OS/2 (with Macintosh and UNIX® on the way).

What's more, you can get started with Notes for less than \$500 per user. In fact, right now more and more companies—both small and large—are using Notes for sales lead tracking, product planning, brainstorming, account management, project tracking, call reporting, quality management and a whole lot more.

So if you're looking for a better way to get people Working Together,[™] maybe you should be taking Notes, too.

"... Notes and cc:Mail reign, respectively, as the technology standard-bearer and market-share leader in work-group software..." (PC Magazine, 3/9/92).



Organizations working to

Technology has made the world smaller. And more competitive. No matter what industry you're in, gathering, analyzing, communicating and presenting information is a critical activity.

How well—and how quickly—you work with information can be what separates you from the competition. There are many organizations who view Lotus as the company that's helping them gain a competitive advantage. Companies like the Boston investment firm of Adams, Harkness & Hill, which has built its communication infrastructure around a suite of Lotus products.

According to Lisa Beaton, Director of End User Computing at Adams, Harkness & Hill:

"We're essentially in the communications business, keeping clients in the U.S. and Europe up to date on our investment opinions."

"To us, analysis equals Lotus 1-2-3. And the compatibility between the DOS and Windows versions is a real advantage. When we looked at word processors, Ami Pro stood alone in the feature-rich, ease-of-use category. So we made it our standard."

"With presentation graphics, we were impressed with the simplicity of Freelance Graphics for Windows. We actually



have people creating presentations who have never even cracked open the manual."

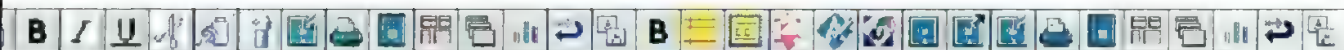
"Our professional and support staffs? They practically live in Lotus Notes. It keeps them close to our clients and to each other. And that's what we have to do to succeed."

"Also, we have no support infrastructure here. So the fact that all products share a common interface is a big win for us."

"And finally, we like the fact we can rely on unified support from Lotus. If I have a question on any



Companies around the world are relying on innovative technologies from Lotus to give them a competitive edge.



together around the world.



specific application, there's one person at Lotus who can answer it directly.

"All in all, we think working with these products has given us a better way to work...with each other and with our clients."

Then there are the IT professionals, at multi-national companies like Ciba-Geigy, who are helping to build problem-specific applications for their organizations with Lotus Notes.

According to Bob Kantor of Ciba-Geigy:

"With Notes, we have a quicker way of delivering some very useful applications to our people. For example, we recently created a customer information and profile

system that was up and running in less than two months.

"In the long run, we imagine a model that serves as a virtual town meeting for everyone in the organization. Where no matter what any of us is trying to accomplish, we'll



Notes lets you maximize your investment in existing hardware, software and networks.

have all the resources of the rest of the organization behind us and available to us. Which means, as IT professionals, we'll be in a much better position to help our company realize its business goals. And to bring a better level of service to our customers."

So given all this, why should Lotus be your business partner? The answer goes beyond our products, into the strategy behind them...a strategy that is driven by the computing needs of our customers. And that represents a real response to the networked computing, information-sharing demands of the 90's. It's a strategy that's focused on organizational productivity...the means by which your company can become more competitive, more coordinated, more connected. It is, in short, a better way to work.



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Lotus

*Based upon registered cc-Mail users. **While supplies last. Demo disks are not available for Lotus Notes. Please inquire for more information.
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Smartcom III is a good product from a good company. But a product as pricey as this one should not lack built-in third-party modem support.

WHITE RIVER SOFTWARE

Telemate

by Jonathan Matzkin

Telemate, Version 3.01, from White River Software, is a \$45 shareware program. Its clean, menu-driven interface, flexible scripting language, and mouse support make it worth considering if you don't require sterling performance.

Under rigorous conditions, *Telemate* was overwhelmed by PC Labs' ASCII transfer test at 57,600 bits per second. The file was sent, but it contained numerous errors. The Xmodem-1K transfer test also produced a file that did not compare properly with the source file. White River Software says it will correct this problem by the time you read this review.

Multiple phone directories, each holding up to 1,000 entries, are offered by the program. Amenities like the scroll-back buffer are readily avail-

able from its easy-to-use menus. Most of *Telemate's* basic features can be quickly learned without referring to the manual.

Telemate supports a good assortment of communications protocols. Several less-common protocols, including SEALink and CompuServe Quick B, are also provided. In addition, *Telemate* allows users to add as many as four external

COMMUNICATIONS COMMUNICATIONS SOFTWARE

protocols defined by DOS batch files. Support is provided via BBS.

Telemate doesn't quite cut it at the highest speeds and under the most rigorous conditions. But its low price, strong assortment of features, and "try before you buy" shareware status make it well worth a look.

EXIS INC.

Telix

by Nate Zelnick

Shareware aficionados who like *Procomm's* look, feel, and speed should take a look at Exis's *Telix*, Version 3.15. It's easy to use and costs a mere \$39. In our tests, *Telix* was up and running in seconds and sending information at 57,600 bits per second. Its lack of support for Zmodem

compression gave it the worst file-transfer performance of any DOS package we tested, however.

The phone book uses a form-based entry system, like *Procomm's*. Each book supports up to 1,000 entries and you can create as

many books as disk space allows. *Telix* supports most common protocols and you can integrate external protocols. The program has no built-in editor. Its strong 140-verb scripting language, SALT (Script Application Language for *Telix*), works a bit like C.

Telix lacks auto-learn scripting and password protection on the dialing directory and has only a few log-on scripts. But you can download extra features from the Exis BBS, including file-tag utilities, an external script learner, and more log-on scripts. The program supports only TTY, VT-52, VT-100/102, ANSI, and AVATAR terminal emulations, and it lacks a driver for the Hayes ESP board. For LAN communications, LANSource (416-866-8575) offers an OEM version of *Telix* in 2- to 99-node configurations.

Exis provides free phone support during normal business hours. You can also post support queries on its BBS. Full documentation is available in electronic

FACT FILE

Telix, Version 3.15

Exis Inc., P.O. Box 130, West Hill, Ontario Canada M1E 4R4; 416-289-4641, BBS 416-439-9399

List Price: For downloaded program, \$39; for disk without printed manual, \$41; for disk with printed manual, \$56.

Requires: 190K RAM, DOS 2.0 or later.

In Short: *Telix* is one of the best deals around. It offers great design and performance at a great price. The program lacks features that corporate buyers might need, but this should not dissuade the general user.

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files. For \$12 extra plus \$5 handling, you can get a printed manual.

At \$39, plus \$2 handling for a registration disk, *Telix* is an outstanding buy for people with general-purpose communications needs.

DATA GRAPHICS

Unicom

by John R. Quain

Data Graphics' *Unicom*, Version 3.0, is the only Windows product in our review to offer the convenience of a toolbar. Modest in features, this \$70 shareware program will not supplant the company comm package, but for users who want the potential of faster transmissions but have limited needs, *Unicom* is promising.

The program has no automatic installation utility and does not include preset modem initialization files or network support. *Unicom* offers only four basic terminal emulations: DEC VT102, DEC VT52, ANSI-BBS, and TTY. But it requires only 656K of hard disk space.

Unicom was one of the first Windows applications to take advantage of an icon bar. Though some of the icons, such as the Search button, seem inscrutable at first, they are valuable for users who forget what settings are hidden in which submenus. None of the icons actually launches a log-on script, but you can handily set parameters for such options as modem setup, terminal display, and default protocols. The standard list of pull-down menus is also included.

The dialing directory comes with over 200 entries for BBSs in Canada and the U.S. Changing the settings for numbers is straightforward, and each entry can be stored along with its own bit-per-second

FACT FILE

Telemate, Version 3.01

White River Software, P.O. Box 938, Unit 105, St. Catharines, Ontario, Canada L2R 6Z4;

BBS 416-733-9052

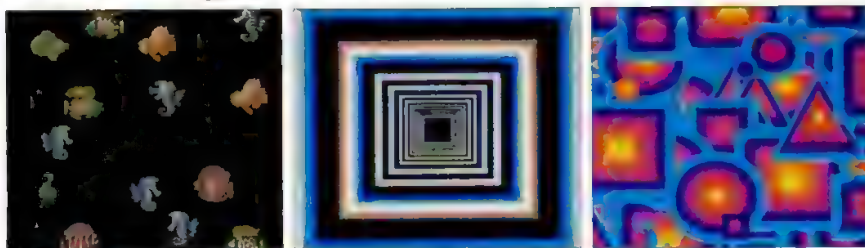
List Price: \$45

Requires: 500K RAM, DOS 3.01 or later.

In Short: *Telemate* has difficulty with 57,600-bps transfers, but for users with lower-speed Hayes-compatible modems, this full-featured, low-cost shareware package provides lots of features at a very reasonable price.

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COMMUNICATIONS

COMMUNICATIONS SOFTWARE



FACT FILE

Unicom, Version 3.0

Data Graphics, P.O. Box 58517, Renton, WA 98058; 206-932-8871.

List Price: \$70.

Requires: 180K RAM, Microsoft Windows 3.1.

In Short: While Unicom is short on business-oriented features and still contains some snags, this shareware package does offer one advanced feature the rest of the other Windows programs lack: a toolbar. The added icons are a welcome relief from multiple pull-down menus, but the program's minor glitches may frustrate some users.

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setting, password, protocol, character setting, and script file. Only two sample scripts are provided, one for MCI Mail and another for CompuServe. The program's scripting language has over 200 verbs for building scripts of your own.

Unicom performed well in PC Labs' Zmodem Interrupt test, correctly noticing an old file and terminating the download. The program had trouble dealing with fast ASCII transfers and screen captures, however, because of its inability to buffer large streams of incoming data properly.

SPEEDY TRANSFERS

Unicom takes advantage of the Windows 3.1 comm driver. The package offers settings for 38.4 kilobits per second, 57.6 Kbps, and 128 Kbps. In reality, though, attempting to go beyond 38.4 Kbps will increase the risk of data loss in any Windows communications package.

There are a few glitches. The directory search function does not prompt you when it fails to find a requested listing. There is also a minor bug in the TTY emulator that prevents file logging in that mode (Data Graphics expects to remedy it in the next maintenance release). Aborts made when dialing or downloading are not as quick as they could be. And if you make an error in selecting settings, Unicom will not correct you like some of the other packages.

According to Data Graphics, the current version is available on several BBSs, but if you decide to use it, the \$70 registration fee (plus \$5 for shipping) is required to receive the documentation and a license number. Even at this price point, Unicom faces some tough competition: *Terminal Plus*, a scion of *Dynacomm*, costs only \$99.95.

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LAN INVENTORY SOFTWARE



PHOTOGRAPHY: THOM O'CONNOR

Optimizing Network Resources

by Carol Ellison

LAN inventory packages help you gather and keep track of vital information about the hardware and software on your network's client stations. PC Magazine Labs tests five packages that keep your LAN optimized and up-to-date.

An adage says the job isn't done until the paperwork is finished. That is certainly true for network management. Documenting networked PCs is a good way to solve present problems and plan for future growth.

Unfortunately, most network managers are too busy keeping their LANs running to worry about documenting them. For them, the charter of the job remains to connect what you have, manage what you connect, and keep it all running. There is hope, however. The network management industry now provides the utilities to help you meet that mandate, and LAN inventory software helps you document and manage your computing assets.

We ran five of these inventory packages through a battery of tests on a network equipped with a wide array of commonly used hardware, swapping video

NETWORKING

LAN INVENTORY SOFTWARE

systems, memory cards, and network adapters in and out of client PCs to see how accurately the products detected and reported the changes. The products tested were Horizons Technology's *LAN Auditor*, Brightwork Development's *LAN Automatic Inventory (LAI)*, Magee Enterprises' *Network HQ*, Tally Systems Corp.'s *PC Census*, and Saber Software Corp.'s *Saber LAA Agent Toolkit*.

What we found was a young market where some of the best products have not yet been released (see the sidebar "The Best Is Yet to Come"). Many programs still mistakenly identify equipment. Others lack critical functionality, like support for Boolean logic. For those reasons, we did not award an Editors' Choice.

NETWORK MANAGEMENT GALORE

In truth, LAN inventory is just one of a suite of management applications available on the market today. In a broad sense, there are some network management applications that monitor or analyze the network and others that monitor or analyze stations on the network, like PC clients and file servers.

Applications that manage the network are found in a dozen different types of tools, including protocol analyzers, network monitors, and wiring hubs. Simple Network Management Protocol (SNMP) stations provide a framework for displaying the information these tools collect.

Applications that manage stations include statistical monitoring packages that collect information about the server for projecting disk, memory, or CPU usage, and software inventory products. LAN inventory is aimed at this segment of the market.

PLANNING AND TRACKING

If an office expects to keep its network running smoothly, it needs an accurate account of the hardware and software on its PCs and file servers, as well as the miscellaneous boards and programs that fill the stockroom. With those numbers, you can project growth, avoid duplicate order costs, accurately record registration and warranty information, and assess the hardware costs associated with a software upgrade.

LAN inventory software collects and records this information automatically, reaching across the network to update client PC information every time a user logs on.

You can find out much of the informa-

tion in these reports without LAN inventory software. You could run utilities such as *PC Tools*, *The Norton Utilities*, or *Mace Utilities* at individual client PCs to collect data on processor type and speed, disk type, memory capacity, video system type, ports, add-in cards, and DOS versions. And before the creation of LAN inventory software, that's what was done.

On a 100-node network, however, managers can waste precious hours walking around to inspect every PC. LAN inventory programs centralize this activity, automatically collecting the data so that managers don't need to leave their own PCs.

All of these products can assist with the

planning aspects of network management, as well as with troubleshooting. With these programs, a manager evaluating the real cost of upgrading to Microsoft Windows can readily determine who can run Windows and which stations will need hardware upgrades. Typically, the products reviewed allow you to add information not collected by the software, such as data on prices, warranties, and service contracts.

Because they keep historical records, these programs can also assist in troubleshooting by detecting such problems as changes to a user's AUTOEXEC.BAT, CONFIG.SYS, and other configuration files; new boards that may create interrupt conflicts with network hardware; missing or stolen equipment; and new or possibly

HIGHLIGHTS

By automatically documenting the hardware and software components of the client stations on a network, LAN inventory software saves you the trouble of going from PC to PC to collect the information.

There are two types of LAN inventory packages: those that work in the foreground and those that work as TSRs on the client PC. Those that run as foreground applications inventory the PC at network log-on. They won't permanently consume RAM, but they may delay log-on. Those that load as TSRs won't delay log-on, but they may consume precious workstation memory.

We reviewed five packages that inventory the PC at log-on. No Editors' Choice has been awarded because the best products are yet to come. Microcom's *LANlord*, for example, will support the Simple Network Management Protocol (SNMP). The LAN Support Group's *BVEquip* and Fresh Technology's *NodeVision* will enable you to probe the PC's hardware for more detailed information.

By quickly detecting changes in users' configurations, LAN inventory programs allow you to spot missing or stolen equipment or interrupt conflicts in users' newly installed adapter cards. The programs typically build databases that you can query using Boolean operators and import into programs

like *dBASE* and *Paradox*.

LAN Auditor and *LAN Directory* work across wide area networks, recording information in a central database that they update periodically when network traffic is light. *PC Census* recognizes over 350 PC models and about 500 brand-name software packages. *Check-It LAN* will be able to inventory more than 2,500 software programs.

LAN inventory programs help with planning purchases of extra hardware if you want to upgrade the users on your LAN to Microsoft Windows. By indicating what kind of hardware you have installed, these programs make it easier to estimate how much extra hardware the client stations on your LAN will need. However, be warned: Users may view LAN inventory as an invasion of their privacy. Be sure to educate them about the LAN inventory process and how it will be used in your organization.

LAN inventory packages often operate across different types of networks, such as *NetWare* and *VINES*. Some, like *LAN Automatic Inventory* and *LAN Directory*, run on other computer platforms, such as the Macintosh. These two products will also work with other utilities from the same vendors to alert you by pager or electronic mail if some threshold you have set has been exceeded.

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LAN INVENTORY SOFTWARE

illegal or virus-infected software that a user installs in a network directory or on a local hard disk.

LAN inventory can also be beneficial to other departments beyond the network manager's. A number of third-party packages use the LAN inventory data collected by the programs reviewed here to target specific niches like accounting and support desks. We'll take a brief look at these packages in the sidebar "Increasing the Value of LAN Inventory Data."

The biggest drawback of LAN inventory programs involves user perception. If users think that the inventory process is too intrusive or burdensome, then LAN inventory won't be successful. Sound out your users and be sure to explain the real-world benefits. Make it clear that this is a management tool, not a weapon for intruding on their privacy. That will save you a lot of hassles in the long run.

LAN INVENTORY ARCHITECTURE

LAN inventory software may be the simplest to use of the various utilities available to network managers. These products are as familiar as any inventory database, allowing you to query, sort, and use the data in reports. Most of the products we review employ logical operators, such as greater-than and less-than signs, letting you see how many stations possess less than an 80386 processor or 4MB of memory.

All of these products are built around a central database. Most vendors use the Btrieve database provided by NetWare. A few have developed their own databases for better performance. The database stores the configuration information gathered by a program or agent running on the user's PC. You can collect the information either when you log onto the network or when you choose to poll the client stations.

The applications reviewed here all run their agents as foreground applications that load when the user logs onto the network. The agents are supposedly innocuous. They inventory the PC and then remove themselves without staying resident in memory.

The problem, however, is twofold. One problem is that the inventory process may take longer than what users will tolerate. That was exactly the problem with *LAN Automatic Inventory*. The second problem is that you can inventory the PC only at log-on time. If you need to update the inventory database while the PC is logged

onto the server, you're out of luck.

Other LAN inventory programs load as TSRs on the client PC and behave somewhat similarly. They require an IPX session and remain in memory while the client is in use. These memory-resident solutions allow access to the client machine at all times, not just at log-on. Furthermore, once they inventory the PC, some packages will remove themselves from memory.

REVIEW CRITERIA

The products in this review had to inventory the PC at log-on, maintain a histori-

cal database, and run on NetWare, Version 3.11.

The LAN Support Group's *BVEquip*, TouchStone Software Corp.'s *Check-It LAN*, Vycor Corp.'s *HelpLine*, Microcom's *LANlord*, and Fresh Technology's *NodeVision* were not shipping in time for our review.

Frye Computer Systems' long-awaited *LAN Directory* is shipping but was unable to complete our battery of tests (see the sidebar "LAN Directory: Worth the Wait"). *LANScan*, also from Vycor Corp., provides hardware inventory, but it reached our offices too late for testing. Like *LAI*, *LANScan* is one part of a suite of help desk applications. The remaining



RATING THE SOFTWARE: SUITABILITY TO TASK

Generally, for LAN managers, more information is better, but not every network site needs a LAN inventory package to track the same kind of data or perform the same duties. Use these scores, which are based on our tests of these packages, along with the product reviews and features table to determine which LAN inventory program will best serve your network administration needs.

Reporting rates the product's ability to produce useful reports of LAN inventory data. This score focuses on the ability provided to the administrator to edit reports, import information into database programs, index results, quickly compile a report on a newly connected PC, and reconfigure a database without destroying the original one. The product should not impose an overly restrictive limit on the number of user-definable fields. The ability to update the information in user-definable fields automatically is a plus.

Monitoring evaluates the software's capability to oversee the network. The ratings take into account whether the program reports all changes to the client station configuration since the last time the software was used and whether it allows the administrator to set threshold levels for IPX and DOS versions or available hard disk space. Polling should not be obvious to network users, and the administrator should have the ability to turn off messages displayed by the program.

Hardware detection rates the product's ability to detect the presence of mice, printers, music boards, and Token-Ring adapter cards and to recognize when network cards are replaced, when the cable from a floppy disk drive has been disconnected, when a video adapter has been switched, and when a floppy disk has been removed from the floppy disk drive. Other tests measure the product's ability to differentiate between EISA and MCA bus types and to identify the hard disk drive type and volume label.

User environment detection evaluates the product's ability to read the network log-on scripts, environment variables, and CMOS information; to differentiate among users and to detect changes in the CONFIG.SYS file, the AUTOEXEC.BAT file, or the system date and time; to indicate when the memory installed on a client station has increased; and to distinguish between MS-DOS and DR DOS, between OS/2 and DOS, and between extended and expanded memory.

SUITABILITY TO TASK	
Product Name	
Reporting	● ○ ○ ○ ○
Monitoring	● ● ○ ○ ○
Hardware detection	● ● ● ○ ○
User environment detection	● ● ● ● ○

- 1—Poor
- 2—Fair
- 3—Good
- 4—Excellent

applications are *DP Umbrella*, *HelpLine*, and *PC Manager*.

Products such as Triticom's *Argus/N*, Network Computing's *LAN Alert*, and Interworks' *Nqir* are not reviewed here because they run as TSR programs in the client station.

Similarly, we did not test The LAN Support Group's *BindView Plus* and Knorzall's *File Wizard*. Both are statistical reporting products that read information from the *NetWare* Bindery to report on and make projections about file server resources, by indicating which users are taking what percentage of disk space. We plan on looking at this type of product in the September 15, 1992, issue.

Still another class of products uses SNMP to monitor network traffic and system resources on large multivendor networks and wide area networks using TCP/IP. These issue real-time alerts if thresholds set by the network manager are exceeded. They include products like Novell's *LANAlert*, ADI Systems' *LAN Exec*, and Network & Communication Technology's *Planet*. They often work with SNMP management systems such as *HP OpenView*, *SunNet Manager*, and Novell's upcoming *Network Management System (NMS)*.

INVENTORY TRENDS

We found a couple of interesting trends among these packages. All of the tested packages gather their information by reading the PC's CMOS. Reading CMOS provides limited information. The next generation of inventory products will provide greater information by performing diagnostics on the PC:

■ **Software tracking.** A fairly new feature in LAN inventory products, software tracking determines when you need to upgrade software site licenses. Interworks provided the first network implementation of software tracking in *Nqir*. The program scans names of executable files and matches them against names in a database of approximately 800 popular

software programs. *LAN Automatic Inventory* and *LAN Directory* use the same means. Horizons Technology says it will include software tracking in *LAN Auditor* early this summer.

A fairly new feature in LAN inventory products, software tracking tells you when you need to upgrade software site licenses.

■ **Wide area networking.** Both *LAN Auditor* and *LAN Directory* conserve WAN bandwidth by storing inventory data at a remote site and then, at a predesignated time, sending the updates to a central server. As the program transfers the information across the wide area network, it uses

data compression to shrink the file size.

■ **Multiplatform support.** Companies run more than just *NetWare*. LAN inventory programs need to run over Banyan Systems' *VINES* and Microsoft's *LAN Manager*, as well as Artisoft's *LANtastic*. Some already support multiple platforms, such as *Saber LAA* and Horizons Technology's *LAN Auditor*. Other vendors are currently working on multiplatform versions of their products. Magee Enterprises' new version of *Network HQ* will operate over *LAN Manager* and *VINES* and should be available by the time you read this.

These vendors are also looking at expanding beyond the PC base to inventory Macintoshes as well. Already, *LAI* and *LAN Directory* collect data about Macintoshes.

■ **Server information.** In addition to polling network client stations for information regarding their installed hardware, these products also collect some file server information. Typically, the information includes the type of processor, the amount of memory, and network card information such as the address. They basically treat the server as another client. *LAN Directory* goes beyond that, however, gathering server-specific information, such as data about the partition and installation, through the use of a *NetWare* Loadable Module (NLM).

Clearly, we haven't seen the best of the LAN inventory products yet. Network

managers need tighter integration between their inventory applications and corporate-wide SNMP management consoles. Microcom's *LANlord* uses a version of SNMP that enables it to integrate its network inventory package easily with SNMP monitoring systems like Hewlett-Packard's *OpenView* and SunConnect's *SunNet Manager*.

Still, there's a pressing need for the packages currently available in the network marketplace. In the following reviews, we'll fill you in on what each one has to offer.



EDITORS' CHOICE

■ Not just yet: Wait for the next crop of inventory products.

None of the products were clear winners for Editors' Choice, and the reason was simple. By the time you read this article, there will be a fresh crop of products, whose reporting and inventorying capabilities will far exceed those of the products we have examined.

With that said, one product—*LAN Auditor*—deserves special mention. Horizons Technology's \$495 LAN inventory program offers the best combination of inventorying capabilities and reporting features available as of this writing.

LAN Auditor features five standard report formats, and it includes a report editor that lets you create new query and report formats by using powerful SQL-like commands. This gives the network administrator great flexibility.

The program works across wide area networks, and it features an attractive Microsoft Windows interface. But the DOS interface, like the documentation, could use some improvement, and the program does not collect information from file servers.

In the version we tested, *LAN Auditor* lacked one other important capability: software tracking. The vendor expects to add this in Version 2.1, which is due out by the time this issue is published.

LAN INVENTORY SOFTWARE TEST-BED

Testing LAN inventory products means being able to recognize a diverse array of hardware and software. To evaluate the stress levels of the products in this review, PC Magazine Labs assembled a test-bed consisting of a variety of bus, processor, video, hard disk, and network adapter types running MS-DOS, DR DOS, and OS/2. All inventory information was collected at the network server and displayed at the monitoring PC.

Network server

Compaq Deskpro 386/25e
8MB RAM, Compaq BIOS
NE2000 Ethernet ISA
LAN card
NetWare, Version 3.11
340MB hard disk
1.2MB and 1.44MB
floppy disk drives
Built-in Compaq VGA card
Sony VGA monitor



Bridge PC

Compaq Deskpro 386/25M
4MB RAM, Compaq BIOS
NE2000 Ethernet card
1MB 16-megabit-per-second
Token-Ring card
NetWare's ROUTEGEN
1.2MB and 1.44MB
floppy disk drives
Built-in Compaq VGA card
Sony VGA monitor



Laptop PC

Toshiba T2000SX-20 laptop
16-MHz 386, 1MB RAM
Xircor External Token-Ring
adapter
Four DOS boot disks:
MS-DOS 3.1, 4.01, and 5.0,
DR DOS 6.0
20MB hard disk
1.44MB floppy disk drive
VGA display



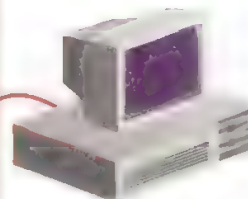
Monitoring PC

Compaq Deskpro 386/25e
4MB RAM, Compaq BIOS
NE2000 Ethernet card
DOS 5.0
340MB hard disk
1.2MB and 1.44MB
floppy disk drives
Built-in Compaq VGA card
Sony VGA monitor



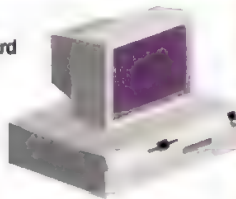
Memory board PC

Compaq Deskpro 386/25e
ISA bus, Compaq ROM BIOS
4MB RAM
Memory board with
additional 4MB RAM
80387 math coprocessor
Etherlink II LAN card
1.2MB and 1.44MB
floppy disk drives
No hard disk
DOS 5.0
Built-in Compaq VGA card
Sony VGA monitor



OS/2 and MCA PC

IBM PS/2 Model 50
10-MHz 386, IBM BIOS
NE232 Ethernet MCA card
OS/2 1.3
1MB RAM, 8MB
extended memory
Two 1.44MB
floppy disk drives
One external 5.25-inch
floppy disk drive
IBM VGA MCA card
Sony VGA monitor



PC-XT

IBM PC-XT
8088, 640K RAM
Two 360K floppy disk drives
NE2000 Ethernet card
Monochrome display



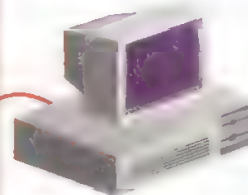
286-based PC with two video systems

IBM PC AT
8-MHz 286, ISA bus
1,664K RAM
Intel AboveBoard
with 8MB expanded memory
30MB hard disk
1.2MB and 360K
floppy disk drives
NE2000 Ethernet adapter
CGA display
Monochrome display



AMD 386-based PC

Tangent TX340SC-60
AMD 386/40 processor
ISA bus, AMI ROM BIOS
8MB extended memory
202MB hard disk
1.2MB and 1.44MB
floppy disk drives
One game port
NE2000 Ethernet card
Microsoft serial mouse
Built-in AMD VGA card
Sony VGA monitor



THE BEST IS YET TO COME

by Carol Ellison

Unless you need LAN inventory today, wait for a while. Four products that will raise the stakes in the LAN inventory market are on the horizon. The LAN Support Group's *BVEquip*, TouchStone Software Corp.'s *Check-It LAN*, Microcom's *LANlord*, and Fresh Technology's *NodeVision* are all scheduled to ship by this summer. Only TouchStone and Microcom have announced the pricing for their products. But one thing is clear: These packages will give network managers a larger look at the hardware on their LANs by combining LAN inventory information with performance and configuration data. Here's what they promise.

BVEQUIP

BVEquip incorporates the report generator from The LAN Support Group's popular file server utility, *BindView Plus*. Like *BindView*, it uses Btrieve as its database engine. In addition to collecting hardware and software data, *BVEquip* sends diagnostic calls to the network shell and function calls through the DOS environment to collect client configuration settings. With that information, *BVEquip* can, for instance, identify potential interrupt conflicts.

One of *BVEquip*'s most notable reporting features is its ability to search for any text string in any file. Thus, you can search all WIN.INI files across the network to see what device "spooler =" is set to. *BVEquip* stores data in four files: a status file containing data collected the last time users logged in, a history file that notes changes in equipment and configurations, a hardware inventory file, and an alert file that flags changes specified by network managers.

CHECK-IT LAN

TouchStone Software Corp.'s *Check-It LAN* first appeared as a value-added process (VAP) for *NetWare 2.x* installations. In Version 2.0, which shipped shortly after our review period,

TouchStone provided the same functions in a *NetWare* Loadable Module (NLM) for *NetWare 3.x* installations. Pricing for *Check-It LAN* ranges from \$249 for 5 nodes to \$1,995 for 250 nodes.

As an NLM, the program communicates with client stations via an IPX session, leaving a 16K TSR on the client. Managers can configure the NLM to load and unload automatically at any time, allowing unattended polling and testing to occur during off hours when users are not present.

Check-It LAN was one of the first applications to combine LAN inventory collection with hardware diagnostics. *Check-It LAN* also features a virus scanner, *PC-cillin*, licensed from Trend Micro Devices. The program can inventory more than 2,500 software programs, automatically run benchmark tests, check for IRQ conflicts, monitor the server, and issue alerts when thresholds are exceeded.

LANLORD

When Microcom acquired Client-Server Technologies, it was only a matter of time before the modem giant entered the world of network utilities. The result is *LANlord*, the first LAN inventory product uniquely suited for the corporate environment.

LANlord is the first product to gather network information using the Simple Network Management Protocol (SNMP). With SNMP, network managers can display the data collected by *LANlord* on an SNMP management system like *HP OpenView* or *SunNet Manager*. SNMP platforms are used to manage other network devices, like bridges, routers, and wiring hubs.

Other capabilities include software monitoring, security, and statistical monitoring. You can set alerts across all of these functions to notify you when thresholds are exceeded at the client station or at the file server.

LANlord's corporate orientation carries a hefty price tag, beginning at \$999 for a 10-user license and ranging up to \$8,999 for a 250-user license.

The product installs on a dedicated OS/2 server and collects network data using an 11K TSR, or management agent, running in the client. *LANlord* communicates with the agents using a new version of SNMP that runs over IPX and not IP. Network administrators access the database using the Manager, a Microsoft Windows-based front end.

One limitation on *LANlord*'s ability to succeed in the corporate environment is its limited network support. In a market where you need to manage client machines connected via different protocols, *LANlord* currently runs only over *NetWare*. Microcom expects to expand the product's scope by adding *Microsoft LAN Manager*, *AppleTalk*, and Unix-compatible modules in the future.

NODEVISION

Fresh Technology's *NodeVision* is a client station complement to the company's popular file server performance monitor, *NetVision*. Like *BVEquip*, it goes beyond collecting standard inventory data. But where *BVEquip* focuses on enhancing configuration management, *NodeVision*'s added value is in compiling performance and diagnostic reports on the file server, as well as on network clients.

The program loads as an NLM on the file server and as a 3.5K TSR in client station memory. The TSR maintains an IPX session that allows a network manager to access the client PCs and run diagnostics at any time. A manager can configure the program to track and project levels of activity and get reports on how resources are utilized. A manager, for instance, could identify the PCs not using their memory boards and swap the unused equipment into client stations that need them. The program includes a customizable report generator and allows you to export data to outside database managers.

Perhaps what's most interesting about *NodeVision* is its ability to create a node profile, a filter for locating sta-

LAN Auditor

by Carol Ellison

tions with a set number of minimum requirements. You can specify what hardware may be needed to upgrade a PC to Windows, for instance, and then locate the nodes conforming to those specifications. File management tools allow you to compress, combine, and purge collected data. ■

BVEquip

The LAN Support Group, 2425 Fountain View, #390, Houston, TX 77057; 800-749-8439, 713-789-0882.

List Price: To be determined.

Requires: To be determined.

CIRCLE 468 ON READER SERVICE CARD

Check-It LAN

TouchStone Software Corp., 2130 Main St., #250, Huntington Beach, CA 92648; 714-969-7746.

List Price: 5 nodes, \$249; 20 nodes, \$495; 50 nodes, \$995; 100 nodes, \$1,295; 250 nodes, \$1,995.

Requires: 384K RAM, DOS 2.0 or later.

CIRCLE 469 ON READER SERVICE CARD

LANlord

Microcom Inc., Client-Server Technology Group, 1 Executive Blvd., #4, Yonkers, NY 10701; 914-968-2300.

List Price: 10-user license, \$999; 20-user license, \$1,599; 50-user license, \$2,499; 100-user license, \$4,999; 250-user license, \$8,999.

Requires: NetWare, Version 2.15 or 3.11; Btrieve, Version 5.15 (NLM or VAP). Client stations require 640K RAM, DOS 3.31, IPX 3.03, Microsoft Windows 3.0a or later. LANlord server requires 4MB RAM, OS/2 1.21 or later. LANlord manager requires 4MB RAM, Microsoft Windows 3.0a.

CIRCLE 470 ON READER SERVICE CARD

NodeVision

Fresh Technology, 1478 North Tech Blvd., #101, Gilbert, AZ 85234; 602-497-4200.

List Price: To be determined.

Requires: To be determined.

CIRCLE 471 ON READER SERVICE CARD

Horizons Technology's *LAN Auditor*, Version 2.0, offers interfaces for both DOS and Microsoft Windows, multiple security levels that make it attractive for use on help desks, and a multi-user mode that you can run across wide area networks. Priced at \$495 for 50 client stations, the program also offers robust search features for sorting information.

There are some drawbacks to *LAN Auditor*. You won't be able to gather information from file servers, and you'll have to contend with both weak documentation and a weak DOS interface.

LAN Auditor consists of a DOS and a Windows module: LAN Auditor DOS (LAD) and LAN Auditor Windows (LAW). While LAD is less than intuitive, the Windows interface is clean and easy to use. LAD does feature mouse support for CUI (Common User Interface) mode, and a mouse is recommended. Without it, you'll find yourself making selections with the Spacebar in one menu and the Enter key in another.

The modules gather data at log-on time. The performance of *LAN Auditor* was excellent. It slowed log-on time only slightly on our eight-node network, even when the initial data collection took place. You can inventory nonnetworked PCs with a *walk-around*, which is a disk created in *LAN Auditor*'s installation routine that you can also use to collect data from standalone PCs. The floppy disk stores the data, which you can then copy into the database.

LAN Auditor really shines in large networks. Two features make it aptly suited for this market. First, both LAD and LAW can operate across multiple networks, allowing a network manager to gather the same information no matter what network operating system a

workgroup is using. Horizons has built-in support for the native transport protocols of *NetWare*, *VINES*, and *LAN Manager*. Second, *LAN Auditor* offers special functionality for multinetwork installations. When networks are connected by slow wide area links, it's important to minimize the amount of traffic a bridge or router must handle. *LAN Auditor*'s multi-user mode provides a solution: It enables separate databases to reside on each LAN, and at a preset time (typically an off-peak hour), it automatically copies the data

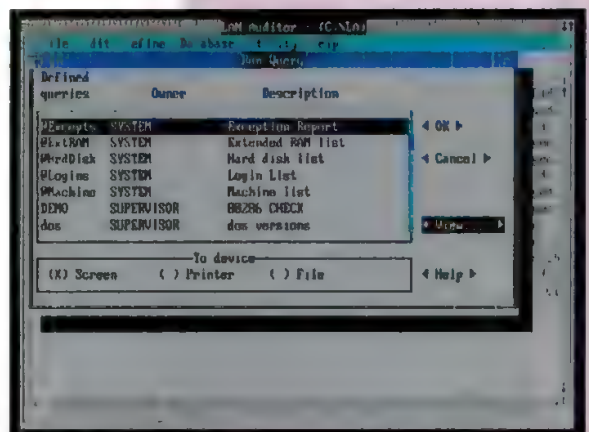
to a centralized database, which deletes the original files. By first gathering the data on multiple local databases and not on the single remote database, *LAN Auditor* eliminates unnecessary traffic across a bridge or router.

DATABASE ADMINISTRATION

Once you gather the information, you can view it by selecting from any number of predefined reports, including an Exception Report that lists all of the changes made to the original database. Horizons also provides a PCs-with-extended-RAM report, a hard disk report, a log-on report, and a complete hardware list.

Administrators can use SQL-like

SUITABILITY TO TASK				
LAN Auditor				
Reporting	●	●	●	●
Monitoring	●	●	●	○
Hardware detection	●	●	●	○
User environment detection	●	●	●	●



Horizons Technology's *LAN Auditor* features five standard reports, labeled System and Supervisor reports, and a report editor that allows an administrator to create new reporting formats, such as the 80286 and DOS-version reports listed here.

commands to define their own queries, and you don't need to know SQL syntax to customize a query. *LAN Auditor's* query editor allows you to select prewritten queries and edit them by choosing prewritten search fields, operators, and values from a menu. The manual clearly spells out which fields you can alter and which ones you cannot. You can't alter

hardware information, for example, but you can add descriptions and serial numbers. This particularly useful capability lets you see, for instance, which printers are connected to a client PC's parallel port. But unless you add descriptions, *LAN Auditor* can't identify the specific

type of device attached to a parallel port. *LAN Auditor* also allows you to append a 64K annotation field to any client record.

Other database management features allow you to search on specific fields or sort fields in ascending or descending order. You can manually add, modify, or delete records. And if you need more than *LAN Auditor's* own robust report genera-

INCREASING THE VALUE OF LAN INVENTORY DATA

by Kellyn Betts

Once you've collected all of your detailed hardware and software configuration information, there's no reason to be stingy with it.

Spread it around to those departments that can use it. The accounting group, for example, can use inventory information to track and bill company resources. The PC support staff can always benefit from a dose of documented machine detail.

There are 11 packages that currently or soon will target these two niches. Help desk packages include Bendata Management Systems Corp.'s *HEAT (Help Desk Expert Automation Tool)*, Brightwork Development's *LAN Support Center*, Coastal Technologies' *HELP!Desk*, Magic Solutions' *Support Magic*, Software Marketing Group's *Help Express* and *Support Express*, Vycor's *Helpline*, and Corporate Software's *Quetzal*.

Vycor Corp.'s *DP Umbrella* is an accounting-oriented package, while Computer Associates International's *CA-Netman/PC* and Trident Software's *InfoTrack* fill both the accounting and help desk functions. Tally Systems Corp.'s *PC Census* is the most likely source of LAN inventory data for these auxiliary packages.

Of all these LAN inventory adjuncts, Trident's \$1,300 *InfoTrack* deserves special mention. Its breadth of coverage and its ability to pull in data from so many of the packages we reviewed make it stand out in its category. In addition to *PC Census*, Trident's four-year-old, multifunction package can import data from Horizons Technology's *LAN Auditor* and Magee Enterprises' *Network HQ*, as well as from three packages we did not review in this issue: Software Publishers

Association's *SP Audit*, Dariana Technology's *PC Sleuth*, and Interworks' *Nquir*. Interfaces for Brightwork Development's *LAN Automatic Inventory*, Cheyenne Software's *Monitrix*, and TouchStone Software's *Check-It LAN* are in development.

Each LAN inventory package collects and classifies data in a slightly different way. Hence, *InfoTrack's* .DBF data banks are populated depending on the packages used to fill them. Hardware details beyond the 12 fields of data that *InfoTrack* routinely collects are stored in an unlimited number of adjunct *feature records*. In some cases, some of the software's 12 main fields require you to enter data manually. For example, the machine and model number information that *InfoTrack* requires is not available in *Network HQ*, Version 1.1. You can upload updates gathered from LAN inventory software to the database at any time.

Business managers and accountants can enter purchase, payment, and depreciation information into *InfoTrack*. Because the software supports the three commonly accepted depreciation types—straight line, double-declining balance, and sum of year's digits—you can take advantage of the relative merits of each.

The package also allows you to distribute hardware and software outlays to different cost centers. It can make mass ordering of computer equipment a much easier task by helping you take advantage of quantity price breaks.

For support, the software gives technicians access to the configuration data they need for initial assessments. *InfoTrack* creates problem records for detailing complaints and resolutions, with key search fields available for

later cross-referencing. The program can also track vendor repairs by recording how long they take and whether they meet the terms of vendor service agreements.

Products like *InfoTrack* allow you to gather important information about your LAN electronically and disseminate it over the network, making the tracking and storage of paper reports and inventory listings less of a necessity than ever before. ■

CA-Netman/PC

Computer Associates International, One Computer Associates Plaza, Islandia, NY 11788; 800-225-5224, 516-342-5224.

List Price: single-user version, \$1,995; three-user version, \$6,995.

Data Imported: Horizons Technology's *LAN Auditor*, Tally Systems Corp.'s *PC Census*.

CIRCLE 525 ON READER SERVICE CARD

DP Umbrella

Vycor Corp., 5411 Berwin Rd., #304, Berwin Heights, MD 20740; 800-888-9267, 301-320-4450.

List Price: per user, \$1,995; per file server, \$3,995.

Data Imported: Brightwork Development's *LAN Automatic Inventory*, Tally Systems Corp.'s *PC Census*, Vycor Corp.'s *LANScan*.

CIRCLE 526 ON READER SERVICE CARD

HEAT

Bendata Management Systems Inc., 1755 Telstar Dr., #101, Colorado Springs, CO 80920; 719-531-5007.

List Price: single-user version, \$2,995; five-user version, \$9,995; site licenses start at \$30,000.

Data Imported: Brightwork

NETWORKING LAN INVENTORY SOFTWARE

tion capabilities, you can export data to an ASCII, *dBASE II*, *dBASE III*, or .DIF file for use with other programs. In a multi-user situation, you can also export it as AUDITOR.DAT to incorporate it into the central database.

Documentation in Version 2.0 could be better. Although the manual will help you get the program up and running eas-

ily, it could be more specific about the fine points of assigning user rights to *LAN Auditor* directories.

Currently, *LAN Auditor*, Version 2.0, scans the DOS version, network shell, AUTOEXEC.BAT, and CONFIG.SYS installed on the client PC. In *LAN Auditor*,

Development's *LAN Support Center*, Magee Enterprises' *Network HQ*, Tally Systems Corp.'s *PC Census*.

CIRCLE 527 ON READER SERVICE CARD

HELP!Desk

Coastal Technologies, 615 Valley Rd., Upper Montclair, NJ 07043; 201-744-3338.

List Price: \$695 per server.

Data Imported: Tally Systems Corp.'s *PC Census*.

CIRCLE 528 ON READER SERVICE CARD

Help Express

Software Marketing Group, 108 Third St., Des Moines, IA 50309; 800-395-0209, 515-284-0209.

List Price: five-user version, \$7,245.

Data Imported: Horizons Technology's *LAN Auditor*, Tally Systems Corp.'s *PC Census*.

CIRCLE 529 ON READER SERVICE CARD

Helpline

Vycor Corp., 5411 Berwin Rd., #304, Berwin Heights, MD 20740; 800-888-9267, 301-320-4450.

List Price: single-user version, \$995; per file server, \$3,495.

Data Imported: Brightwork Development's *LAN Automatic Inventory*, Tally Systems Corp.'s *PC Census*, Vycor Corp.'s *LANScan*.

CIRCLE 530 ON READER SERVICE CARD

InfoTrack

Trident Software, 1001 Bridgeway, #104, Sausalito, CA 94965; 415-388-1646.

List Price: \$1,300.

Data Imported: Dariana Technology's *PC Sleuth*, Horizons Technology's *LAN Auditor*, Interworks' *Nquir*, Magee Enterprises'

Network HQ, Software Publishers Association's *SP Audit*.

CIRCLE 531 ON READER SERVICE CARD

LAN Support Center

Brightwork Development Inc., 766 Shrewsbury Ave., Jerral Center West, Tinton Falls, NJ 07724; 800-552-9876, 908-530-0440.

List Price: \$595 per server.

Data Imported: Brightwork Development's *LAN Automatic Inventory*.

CIRCLE 532 ON READER SERVICE CARD

Quetzal

Corporate Software, 275 Dan Rd., Canton, MA 02021; 800-677-4000, 617-821-4500.

List Price: 1- to 4-user version, \$7,995; per file server, \$12,000.

Data Imported: Tally Systems Corp.'s *PC Census*.

CIRCLE 533 ON READER SERVICE CARD

Support Express

Software Marketing Group, 108 Third St., Des Moines, IA 50309; 800-395-0209, 515-284-0209.

List Price: single-user version, \$1,495; five-user version, \$2,495.

Data Imported: Horizons Technology's *LAN Auditor*.

CIRCLE 534 ON READER SERVICE CARD

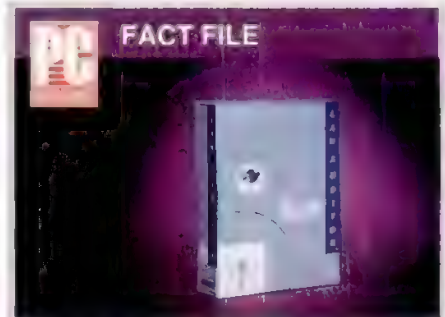
Support Magic

Magic Solutions Inc., 180 Franklin Turnpike, Mahwah, NJ 07430; 201-529-5533.

List Price: single-user version, \$3,995; four additional users, \$1,000.

Data Imported: Tally Systems Corp.'s *PC Census*; imports other network inventory data as ASCII files.

CIRCLE 535 ON READER SERVICE CARD



LAN Auditor, Version 2.0

Horizons Technology Inc., 3990 Ruffin Rd., San Diego, CA 92123; 619-292-8320.

List Price: 50 client stations, \$495; each additional group of 100 client stations, \$295
Requires: 640K RAM (2MB RAM for Microsoft Windows), 3MB to 5MB hard disk space, DOS 3.0 or later, Microsoft Windows 3.0 or later.

In Short: *LAN Auditor* offers a strong, customizable query-and-search facility and accurately tracks hardware and operating system files on client stations—even across wide area networks. You can install *LAN Auditor* with a Microsoft Windows or DOS interface, but the Windows interface is far more intuitive and easy to use. The program won't search for information on file servers.

CIRCLE 505 ON READER SERVICE CARD

Version 2.1, which should be available by the time you read this, Horizons Technology expects to track applications software. In addition to a library of applications, the new version of *LAN Auditor* will be able to learn unknown programs, enabling you to extend the types of applications recorded.

LAN Auditor's comprehensive inventory of office hardware and client station information makes its awkward CUI interface worth the hassle. Other DOS-based programs are easier to use, but Windows users will love the ease and functionality that come with the graphical user interface. With the upcoming addition of software tracking, *LAN Auditor* should be a top choice for anyone running an inventory package in a Windows environment.

LAN Automatic Inventory

by Carol Ellison

Brightwork Development's *LAN Automatic Inventory (LAI)*, Version 2.10, shines brightest when used with other applications. The *NetWare*-compatible program works with Brightwork's *LAN Support Center*, helping to compensate for its own weak reporting and querying features. At \$695 per server, *LAI* is a

NETWORKING

LAN INVENTORY SOFTWARE

reasonably priced package, especially for large networks. But be warned: *LAI* suffers from network problems and an inability to identify items accurately.

LAI runs only on *NetWare* networks and ships with a runtime version of Novell's database manager *Btrieve*, which it uses to collect and process inventory data.

You install the software on the file server, and it polls file servers, connected PCs, Macintosh clients, and standalone PCs for information about their hardware and software.

Installation is simple, though not automatic. You must create the directory yourself, assign user rights, and add lines

to the system log-on script. The process is well documented, and *LAI*'s manual offers a short tutorial on operation.

HELP DESK ORIENTATION

When used with Brightwork's *LAN Support Center*, a product centering

on automated help desk operations for network users, *LAI* allows managers to issue detailed reports that fully describe the components, setup, and configuration of a client station that needs to be repaired or upgraded.

Details of the collected data appear on users' screens whenever they log on or at

set intervals. You can prevent users from seeing this data by configuring the program not to display it.

One of the problems with *LAI* is its performance. Users will experience a noticeable delay when an inventory of their machines is performed. The more software on the client, the longer the delay. Another problem we noticed was that once *LAI* records the network card setting, the card's I/O address may produce a conflict and hang a client station. The troublesome I/O address on Token-Ring cards is 360h, and ARCnet cards set with an I/O address of 2E0 may also experience conflicts when *LAI* runs the inventory. Most Ethernet LANs will not experience a problem, since 360h is normally a reserved address. At this writing, Brightwork Development was investigating the problem.

SUITABILITY TO TASK				
LAN Automatic Inventory				
Reporting	●	●	○	○
Monitoring	●	●	●	○
Hardware detection	●	●	●	○
User environment detection	●	●	●	●

LAN DIRECTORY: Worth the Wait

by Carol Ellison

What makes *LAN Directory* exceptional is the variety of information it provides. Designed for large, multinode networks, the \$495 program collects about 800 pieces of data from the file server and hundreds more from client stations, including Macintoshes—far more detailed data than you would get from other packages we reviewed.

Frye Computer Systems announced *LAN Directory* in October 1990, but it was not until February 1992 that the product appeared. Even then, several modules remained under development. Because the program was not finished in time for our test period, we could not include it in this set of reviews. But no other product in our roundup combined such fast and detailed data collection with such powerful querying and reporting capabilities.

The program and all of its files, including collection agents, database engine and manager, and data files, are stored on the file server. As users log on, the collection agent writes data into a data file the network administrator can access by using the database manager. Frye developed a proprietary database engine that includes many more collection fields than competing programs use. Like several of them, it can read configuration data across bridges, routers, and wide area networks, and can conserve bandwidth by using data compression during the transfer.

Like Brightwork Development's *LAN Automatic Inventory*, Frye's *LAN Directory* is one in a suite of utilities designed to make managing a network easier. But unlike *LAI*, *LAN Directory* reports all interrupts and addresses in use on the client machine, not just on the network card. A manager can immediately determine how new cards must be configured based on the interrupts known to be available.

LAN Directory's query and reporting features recognize a full complement of logical operators and work as well as *LAN Auditor*'s. Managers can select them from a menu to identify

all client stations not already running Microsoft Windows, and can set thresholds to determine available hard disk space. You can notify a person via e-mail or pager when a client passes a threshold by linking *LAN Directory*'s database with another Frye product, the *NetWare Early Warning System (NEWS)*. *LAN Directory* also provides real-time monitoring and troubleshooting information if you share its databases with *The Frye Utilities for Networks*.

LAN Directory installs itself automatically and assigns all users the read/write rights that other programs require the network manager to change manually. But although it was simple to collect client information, we were not able to gather server information at first. Only late in the user manual does it state that you must load the proprietary server NLM (*NetWare Loadable Module*) before you can run the executable program.

MORE TO COME

LAN Directory did have a bug. Several client machines hung during testing when the program polled for data it could not collect. You can determine which data entry is causing the problem by turning off options one by one, but this debugging shouldn't be necessary. At this writing, Frye was adding three modules to the program that would allow a manager to edit users' system files, update their network shells, and upgrade the software on their local hard disks across the network. This promises to be a winning combination. ■

LAN Directory

Frye Computer Systems Inc., 19 Temple Pl., Boston, MA 02111; 617-247-2300.

List Price: \$495.

Requires: 640K RAM, 1.5MB hard disk space on the file server, DOS 3.0 or later.

CIRCLE 467 ON READER SERVICE CARD

Imagine getting twice the Bernoulli for two-thirds the price.

The new Bernoulli 90MB.



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generation of

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At 90 megabytes per
removable disk, we've more
than doubled our capacity.
Yet the new Bernoulli 90 is
actually less expensive than
the Bernoulli 44. A lot less.
And with a new, 19-msec*
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NETWORKING LAN INVENTORY SOFTWARE



Brightwork Development's **LAN Automatic Inventory** uses a **NetWare-like** interface in its audit log file report, where it provides the version number, size, and location of programs like **Btrieve**, the **Windows Filer**, and its own application files.

LIMITED OMNISCIENCE

LAI provides both user-definable and default fields for tracking network data. The user-definable fields are easy to fill in, using the standard C-Worthy interface popularized by **NetWare**.

The default data fields are filled in by **LAI**. Like many applications, **LAI** reads the stations' CMOS to determine the presence of drives. On our tests, it was unable

to detect missing B: drives until we reconfigured the system setup in the altered stations. The program is also unable to distinguish between SX and DX, and between AMD and Intel processors; this information can be entered manually into a notes field. It does accurately report expanded and extended memory in hardware, but not when a memory manager recon-

figures memory.

Searching for the collected information under **LAI** can also be difficult. Conditional operators aren't supported. Thus, you can search for all 80286 client PCs or 8088 clients, but you cannot search for all clients with less than an 80386 processor. If you wish to find all clients that do not meet certain requirements, you'll have to export the database to another program. **LAI** exports records in both fixed-length and delimited ASCII formats.

Because of its limited querying and reporting features, **LAN Automatic Inventory** is not for those looking for a single solution to their inventory needs. It does offer a good solution if you already keep reports in an outside database, and naturally it's ideal for offices that want to integrate inventory records with automated help desk activities in Brightwork's **LAN Support Center**.

Network HQ

by Kellyn Betts

If taking inventory of your network without a hassle is important, you'll want to check out Magee Enterprises' **Network HQ**, Version 1.1. This \$395 package may not provide as much information as its competitors, but the program's ease of use and well-written manual make learning it a breeze.

The software takes up 96K of RAM and executes from the System Login Script; you can optionally run it without user notification. **Network HQ** supports only **NetWare**. The main problem with the present version of **Network HQ** is that the only clues it gives to aid in PC identification are the processor type, bus type,

SUITABILITY TO TASK				
Network HQ				
Reporting	●	●	○	○
Monitoring	●	●	●	●
Hardware detection	●	●	●	○
User environment detection	●	●	○	○

and BIOS ID and date. The program gives no information about the processor speed, SX or DX class, manufacturer, or model number. But if your organization has standardized on one type of machine, or buys machines like Compaqs that announce their maker in their BIOS, these meager details may be all you need for your inventory.

Network HQ gives you an excellent record of machine configuration. Each time a user logs onto **NetWare**, it captures information about hard and floppy disks, memory, coprocessors, ports, video, and more to a comma-delimited ASCII file that you can export to a .DBF-compatible database program. In our testing, the software did experience some problems in spotting a couple of obscurely configured parallel ports, which also tripped up **PC Census**. The tidbits that the software tracks are keyed to the serial number of the LAN adapter inside the PC, allowing it to tell you who logs onto various PCs on the network.

Because it can record threshold information, **Network HQ** lets network managers set minimum versions of DOS, **NetWare** shells, IPX, and minimum amounts of DOS memory, EMS memory, C: drive space, and D: drive space. It collects this



LAN Automatic Inventory, Version 2.10
Brightwork Development Inc., 766 Shrewsbury Ave., Jerral Center West, Tinton Falls, NJ 07724; 800-552-9876, 908-530-0440.
List Price: \$695 per file server.
Requires: 512K RAM, 1MB hard disk space on the file server, DOS 3.3 or later.
In Short: **LAN Automatic Inventory** collects a substantial amount of data on **NetWare** networks, but its limited reporting and querying capabilities need help from Brightwork Development's **LAN Support Center**. **LAN Automatic Inventory** also experiences problems with some network cards, and it takes a long time to collect data.

CIRCLE 506 ON READER SERVICE CARD



Network HQ, Version 1.1
Magee Enterprises Inc., P.O. Box 1587, Norcross, GA 30091; 800-662-4330, 404-446-6611.
List Price: \$395 per file server.
Requires: 300K RAM, 300K hard disk space, DOS 3.1 or later.
In Short: **Network HQ** is easy to use but doesn't provide as much information as other LAN inventory products. Version 2.0, which should be out by the time you read this, will improve **Network HQ's** detection capabilities.

CIRCLE 507 ON READER SERVICE CARD

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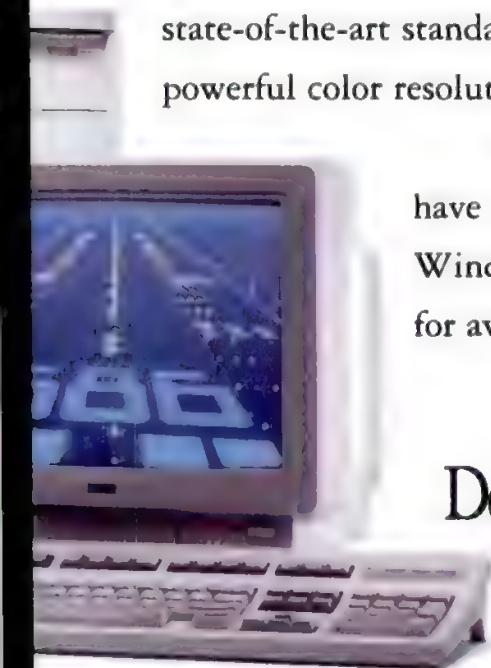
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| ☐ The Desktop Direct Catalog | _____ | _____ | _____ |

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I am interested in a: ☐ 386 ☐ 486 ☐ Other ☐ Not Sure

How many applications will your PC(s) run in a typical workday? _____

How many PCs do you anticipate purchasing over the next 12 months? _____

Are you interested in leasing? ☐ Yes ☐ No

_____ Immediately; ☐ 1-3 months; ☐ 3-6 months; ☐ 6-12 months

What best describes the type of work the system will be used for?
(Check all that apply)

- | | |
|---|---|
| ☐ Word Processing | ☐ Education |
| ☐ Order-entry | ☐ Design (CAD/CAM) |
| ☐ Database (filing records) | ☐ Engineering |
| ☐ Financial Calculations | ☐ Industrial Process Control |
| ☐ Retail Store Management | ☐ Scientific Research |
| ☐ Desktop Publishing | ☐ Software Development |
| ☐ Other industry-specific applications
(please specify) | ☐ E-Mail |

Which of these graphics-oriented applications best describes your needs?
(Check all that apply)

- | | |
|---|--|
| ☐ Desktop Publishing | ☐ Image Processing |
| ☐ CAD/CAM | ☐ AutoCad |
| ☐ Realtime Modeling | ☐ Business Graphics |
| ☐ Animation | |

How many people work in your group, department or small business?

- | | |
|---------------------------------------|--------------------------------|
| ☐ Less than 10 | ☐ 20-35 |
| ☐ 10-20 | ☐ More |

Is your desktop operating system:

- | | |
|---|--------------------------------|
| ☐ DOS | ☐ UNIX™ |
| ☐ DOS with Windows | ☐ VMS |
| ☐ OS/2 | ☐ Other |
| ☐ MAC | |

LAN Communication

How many PCs do you have installed? _____

From how many manufacturers? _____

What kinds of connections does your PC(s) require? (Check all that apply)

- | |
|---|
| ☐ Links with other PCs in the immediate surroundings |
| ☐ Connection to the local area network (LAN) throughout a building |
| ☐ A line to a host system in a remote location |

What kind of media (cable) is used in your LANs today? _____

What is the networking software now being used in your company? _____

What kind of host system will your PC communicate with?

- | | | |
|----------------------------------|------------------------------|--------------------------------|
| ☐ Digital | ☐ IBM | ☐ Other |
|----------------------------------|------------------------------|--------------------------------|

What Kind of Service Do You Really Need?

- | | |
|---|--------------------------------------|
| ☐ On-site Hardware Support | ☐ Training |
| ☐ Software Support | ☐ FAX Hotline |
| ☐ Telephone Support | |

How many of your users take portables on the road? _____

Do you currently have a service contract(s) for your PCs? How Many? _____

Does your service provider offer Multivendor support? ☐ Yes ☐ No

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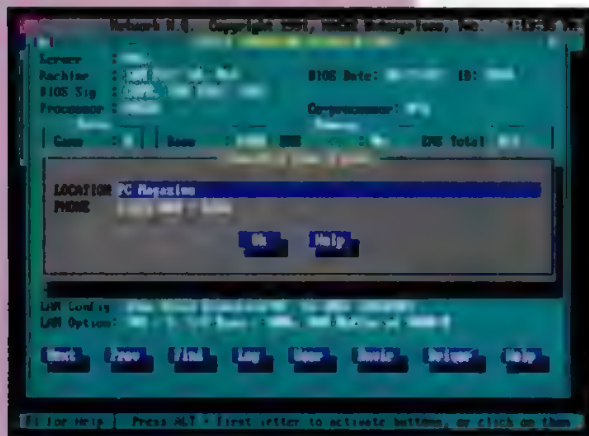
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information in real time, and you can view the data through the Warning Log file in the administrator's version of the software. The portion of the program accessible by the administrator requires 300K of RAM. The software's two simple report options do not include this information, but because the program collects it in an ASCII file, you can easily print it or export it to another program.

We also saw a promising prerelease copy of *Network HQ*, Version 2.0, which should be shipping by our publication date. The new version will substantially beef up the program's surveillance capabilities. Most important, like *PC Census*, it will identify the manufacturer and model of each machine on the network and "learn" to identify new machines. Processor clock speed and hard disk type are two other important detection additions promised in the new software, which will run on *LAN Manager* and *VINES* as well as *NerWare*. Version 2.0 will also allow users to increase the number of user-definable fields for holding manually entered information about data the product does not automatically gather. *Network HQ*, Version 2.0, will cost \$395 for a 100-user version and \$495 for an unlimited single-server version.



Almost all of the information collected automatically by Magee Enterprises' *Network HQ* can appear on one screen. The additional Location and Phone fields shown here can help a LAN administrator correlate this data with specific PCs after filling them in manually. The software creates an ASCII database that keys data to the factory ID of each PC's network adapter.

PC Census

by Kellyn Betts

Network managers beware: *PC Census*, Version 3.01, may not be for you. Despite its unusual ability to identify the type of machine in the inventory process, this LAN inventory product from Tally Systems suffers from three major drawbacks.

First, it's expensive for networks of over 45 PCs. Second, it lacks threshold capability. And finally, it doesn't track network data.

PC Census consists of two components. The Collector runs on the client PCs, where it requires 384K of RAM. The Data Administration portion sits on the server and takes up at least 2.9MB of disk space and 475K of RAM. It builds a *dBASE*-compatible database, combining information users fill in about monitors, keyboards, and printers with information the software detects.

PC Census does its machine identification trick by taking a proprietary, five-part machine fingerprint that consists partially of a BIOS read. Version 3.01 immediately recognizes over 350 PC models, including old IBM PCs and Compaq portables. The system can learn other models: When you enter information about a new system into the database, that system's fingerprint is taken, and the software will recognize the next instance that crosses its files. *PC Census* can also recognize over 906 specific versions of 499 brand-name software packages and can learn to recognize more.

PC Census's Collector successfully identified most equipment on our test network. However, the Collector was unable to track some details that competitors typically grab. It couldn't tell whether machines' buses were EISA, ISA, or MCA. It did not read *CONFIG.SYS* or *AUTOEXEC.BAT* files, hardware IRQ statuses, or the amount of free disk space.

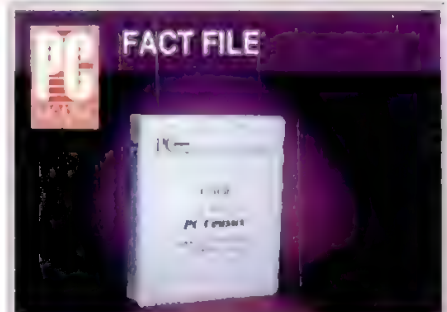
The Collector also missed some of the different parallel ports. A utility is available on request from Tally for reading the *AUTOEXEC* and *CONFIG.SYS* files. It had trouble differentiating between extended and expanded memory in an old IBM AT with an Intel AboveBoard. Because the NE2000 Ethernet adapters used in the network were set to use interrupt 360, they tripped up the software. Tally says that the next version of *PC Census* will not be troubled by this address.

PC Census does not provide much network information beyond the type of LAN adapter and the log-on time and date. Tally representatives promise that

the next revision will address more needs of network users. *PC Census*'s Administrator proved an acceptable but less than ideal way to provide inventory information to LAN managers. Probably the major drawback was the program's inability to set or monitor thresholds to alert you to problems such as lack of space on a node's hard disk.

On the positive side, the Administrator lets you remove selected unwanted fields; many LAN inventory managers do not allow data field changes. But the Administrator cannot integrate newly collected

SUITABILITY TO TASK				
PC Census				
Reporting	●	●	●	○
Monitoring	●	●	○	○
Hardware detection	●	●	○	○
User environment detection	●	●	○	○



PC Census, Version 3.01

Tally Systems Corp., P.O. Box 70, Hanover, NH 03755-00700; 800-262-3877, 603-643-1300.

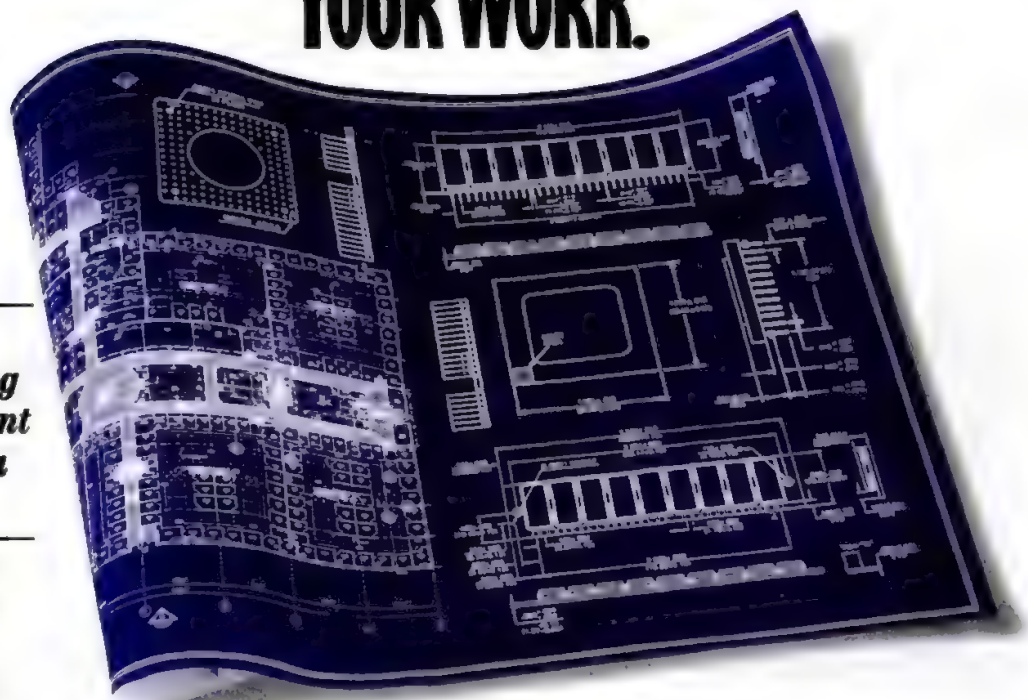
List Price: \$15.75 per PC for 100 PCs; \$15.50 per PC for 200 PCs; \$14.75 per PC for 300 PCs; \$14.50 per PC for 500 PCs; \$13.75 per PC for 800 to 1,000 PCs.

Requires: 512K RAM, 5MB hard disk space, DOS 2.1 or later.

In Short: *PC Census* is not incredibly network-savvy, but that does not stop it from reaching out across the cables to catalog lots of data, including the PC's manufacturer and model information. The program is expensive for large networks, however, and it does not offer a threshold capability.

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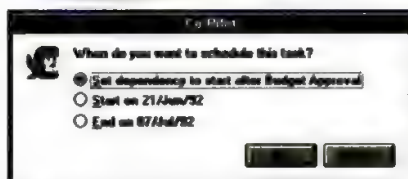
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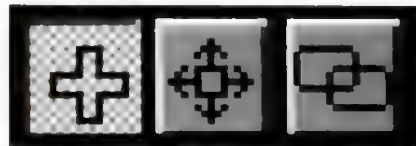
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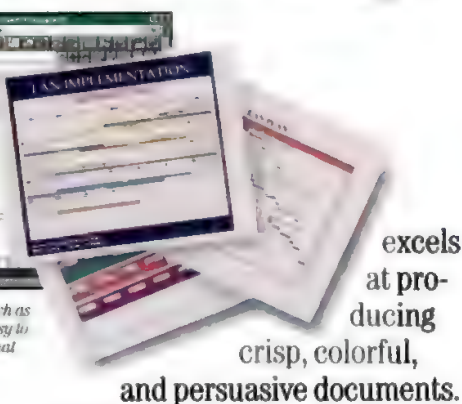
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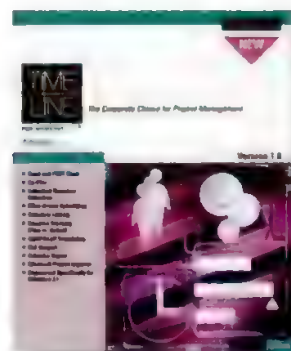
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CIRCLE 344 ON READER SERVICE CARD



SUMMARY OF FEATURES

The five LAN inventory packages we review here have a number of features in common. All five products, for instance, track the user's amount of conventional RAM, the video adapter type, parallel and serial ports, and the BIOS version and date. They also inventory each PC's floppy disk and hard disk drives (including the total capacity and number) and operating system software.

For consistency, we compare each product's standard features only. Here is how they stack up.

☒ —Yes ☐ —No

	Saber LAA Agent Toolkit	LAN Auditor	LAN Automatic Inventory	Network HQ	PC Census
List price (per file server)	\$1,195.00	\$495.00 (first 50 client stations)	\$695.00	\$395.00	\$15.75 per PC (for 100 PCs)
NETWORK OPERATING SYSTEMS SUPPORTED					
NetWare versions supported	2.1x or later	2.1x or later	2.1x or later	2.1x or later	2.1x or later
VINES versions supported	4.x or later	4.x or later	4.1 or later	4.x or later	4.1 or later
LAN Manager versions supported	2.x or later	2.0 or later	None	2.0 or later	1.3 or later
Supports other NetBIOS-compatible LANs	☐	☐	☐	☒	☒
CLIENT OPERATING SYSTEMS SUPPORTED					
DOS	☒	☒	☒	☒	☒
Microsoft Windows	☒	☒	☐	☒	☐
ADMINISTRATOR INTERFACE					
DOS character mode	☒	☒	☒	☒	☒
DOS graphics mode (proprietary GUI)	☒	☐	☒	☐	☐
Microsoft Windows	☒	☒	☐	☒	☐
NETWORK SUPPORT					
Polls multiserver LANs	☒	☒	☒	☒	☐
Inventories across router or bridge	☐	☒	☒	☒	☐
Inventories across wide area networks	☐	☒	☒	☒	☐
Creates user stations from NetWare Bindery	☐	☒	☒	☒	☒
MAINTENANCE AND ADMINISTRATION					
Automatically collects component information:					
On user log-on	☒	☒	☒	☒	☒
On request	☐	☒	☐	☐	☒
Sends e-mail to administrator automatically	☒	☐	☐	☐	☐
Provides the date of changes	☒	☒	☒	☒	☒
Processes information into database at a preset time	☐	☒	☐	☐	☒
Maintains database of inventory information:					
On file server	☒	☒	☒	☒	☒
On polling workstation	☐	☒	☐	☐	☒
User must be logged onto network for inventory to occur	☒	☐	☒	☒	☐
Administrator can manually enter:					
Telephone number	☐	☒	☐	☒	☒
Physical location	☒	☒	☒	☒	☒
User's name	☒	☒	☒	☒	☒
Automatically identifies component manufacturer	☐	☒	☒	☒	☒
Automatically notifies users of inventory	☒	☒	☒	☐	☐
Tracks number of products in stock	☐	☐	☐	☒	☒

CONTINUES

NETWORKING

LAN INVENTORY SOFTWARE

SUMMARY OF FEATURES

☒ — Yes ☐ — No

**Saber LAA Agent
Toolkit**

LAN Auditor

**LAN Automatic
Inventory**

Network HQ

PC Census

REPORTS

Administrator can customize reports

Reports can list all equipment by:

Component type

Date

Department

Group

Inactive workstations

Station address

User

DATA EXPORT FORMATS

Fixed-length ASCII

Delimited ASCII

.DBF

.DIF

SYLK

.WKS

User-defined

Other

SEARCHES

Database type or format included as standard

Supports searches by administrator-specified variables

Supported operators for searching:

AND

OR

Exclusive OR

NOT

Equal

Greater than

Less than

Less than or equal to

Not equal

Nested search

THRESHOLDS

Administrator is notified when thresholds are exceeded

Method of notification

INFORMATION COLLECTED: CLIENT STATION

EISA

ISA

MCA

Hard disk free space

Mouse type

Math coprocessor

CD-ROM drive

LAN adapter information:

8-, 16-, 32-bit adapters

Driver version

I/O address

Interrupt number

DMA information

Node address

User name

Log-on date

Log-on time

IPX version

Network shell version number

Network operating system version

N/A—Not applicable: The product does not have this feature.

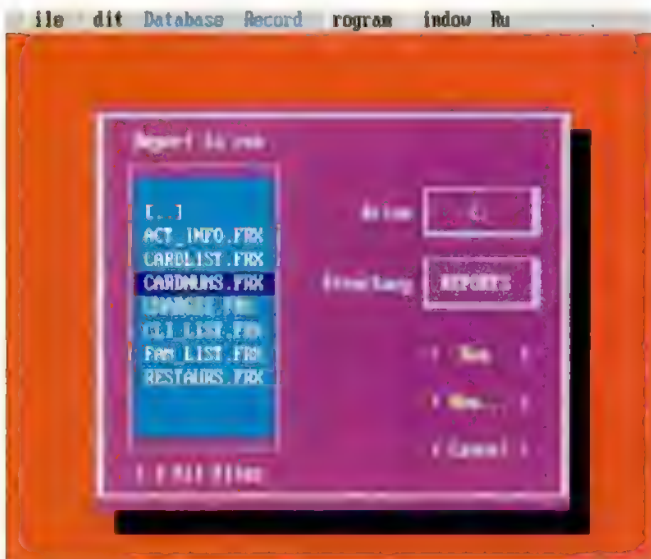
CONTINUES

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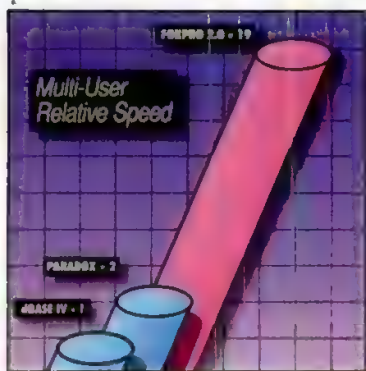
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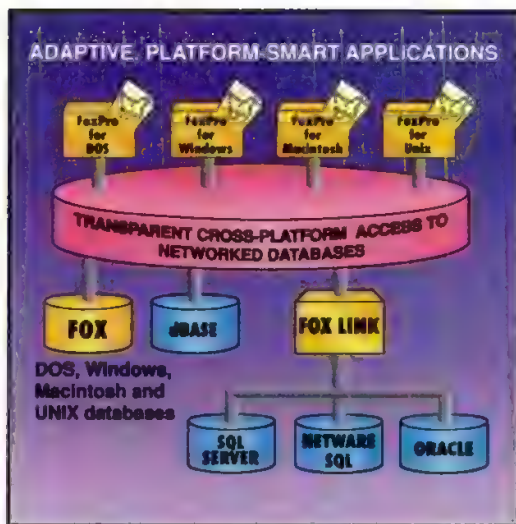
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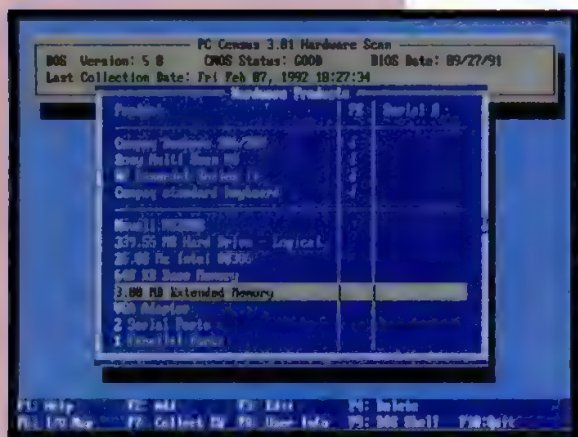
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NETWORKING

LAN INVENTORY SOFTWARE



Tally Systems Corp.'s *PC Census* presents its data in the same format, no matter what the source; the check on the screen shown here indicates manually entered data. The program includes many fields for collecting data on individual PCs, but not as many for network data.

information in real time; you must recompile the database each time the program runs. And although the preformatted reports should be adequate for most needs, they are extremely plain. The database is in .DBF file format, though, so you can export it to *dBASE*, *Paradox*, or *Q&A* for

further reporting and analysis.

Pricing for *PC Census* depends on the number of PCs on your network. For 100 PCs, it's \$15.75 per PC; the price per computer is \$15.50 for 200 PCs, \$14.75 for 300 PCs, \$14.50 for 500 PCs, and \$13.75 for 800 to 1,000 PCs. Users get Collector software updates free for the first year; afterward they are priced at 18 percent of the system cost.

Saber LAA Agent Toolkit

by Kellyn Betts

Saber Software Corp.'s *Saber LAA Agent Toolkit* (LAN Administrative Architect), Version 1.0, brings LAN inventory to Microsoft Windows. The \$1,195 program is one component in a suite of network management tools that includes Windows support. *LAA* provides some useful infor-

The real power of *LAA* is that it provides a variety of different network management functions, only one of which is hardware inventory.

mation but does not always count the number of parallel ports in a PC accurately. It also requires too much data to be entered manually for your records to be useful. Finally, the documentation leaves out important installation and printing information.

The real power of *LAA* is that it provides a variety of different network management functions, only one of which is hardware inventory. *LAA*'s flexibility is largely the result of its modular architecture. A Windows 3.x front end called the Console displays the network information, which is gathered by six DLL (dy-

SUMMARY OF FEATURES

☒—Yes ☐—No

Saber LAA Agent Toolkit

LAN Auditor

LAN Automatic Inventory

Network HQ

PC Census

INFORMATION COLLECTED: FILE SERVER

Processor type	☒	☒	☒	☒	☒
Server RAM	☒	☒	☒	☒	☒
Parallel ports	☒	☒	☒	☒	☒
Serial ports	☒	☒	☒	☒	☒
Number and type of hard disks	☒	☒	☒	☒	☒
Hard disk free space	☒	☒	☒	☒	☒
Math coprocessor	☒	☒	☒	☒	☒
Tape cartridge backup	☒	☒	☒	☒	☒
LAN adapter information:					
8-, 16-, 32-bit adapters	☒	☒	☒	☒	☒
Driver version	☒	☒	☒	☒	☒
I/O address	☒	☒	☒	☒	☒
Interrupt number	☒	☒	☒	☒	☒
DMA information	☒	☒	☒	☒	☒
Network shell version number	☒	☒	☒	☒	☒
Network operating system version	☒	☒	☒	☒	☒
Bridge driver version number	☒	☒	☒	☒	☒

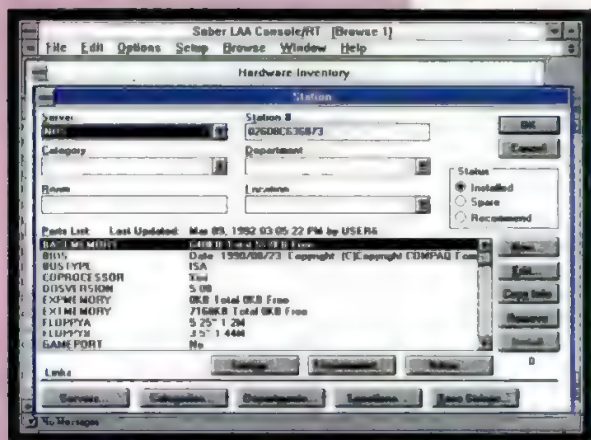
SOFTWARE

Tracks specific versions of workstation applications	☒	☒	☒	☒	☒
Number of versions	N/A	N/A	1,700	650	906

N/A—Not applicable: The product does not have this feature.

ENDS

NETWORKING LAN INVENTORY SOFTWARE



The hardware agent inside Saber Software Corp.'s *Saber LAA Agent Toolkit* inventory program collects only data of strategic importance to LAN administrators, but it does not provide as much information as its competitors. The hardware-sensing portion relies too much on hard-to-remember *NetWare* addresses, as shown here in the station number entry.

dynamic link library) applications called *agents*.

Aside from hardware inventory, *LAA* provides software metering, network event logging, file auditing, an application scheduler, and disk monitoring. We reviewed only the hardware inventory agent, since it most closely matched our review criteria.

All of the various functions are network-independent. Thus, a network manager can use these administrative tools to manage *NetWare*, *VINES*, *LAN Manager*, or other *NetBIOS*-compatible networks.

The hardware agent harvests far less information about networked PCs than

any of the single-purpose programs we reviewed. The 17 fields of data it does collect are well chosen, showing LAN administrators each user's PC operating environment: CPU, co-processor, bus, memory, ports, floppy and hard disk drives, video, DOS versions, network shell variables, and CONFIG

.BAT files. You can manually enter information about other machine components such as network adapters, keyboards, and CD-ROM drives into the *Btrieve*-format database the program creates.

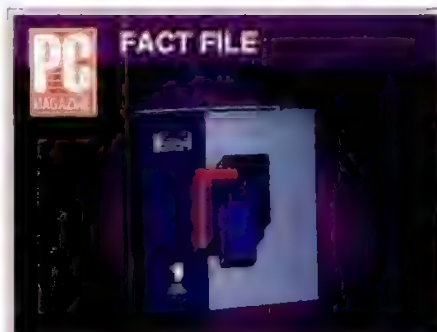
You can augment this information with other details required for record-keeping: serial numbers, descriptions, warranty information, and so on. And you can assign codes to manufacturers and vendors when you enter this information. The software also has fields in which you can manually enter physical location information.

After you collect the hardware information, viewing it can be something of a challenge, unless you happen to have a working knowledge of the *NetWare* connection ID of every user attached to your network. This is the only information, besides the server ID, by which you can sort the network information, and it can easily change.

Printing any of the four preformatted reports can also be problematic. The manual does not mention that the application prints exactly what is on the screen you're viewing. Since the amount of data is wider than an 8.5- by 11-inch sheet of paper, and there is no preview mode, it's difficult to print all of the columns you may want.

We had some difficulty getting *LAA* up and running, mostly because of the product's ambiguous manual. The supplemental manuals, which detail how to set up Windows on LANs and how to run *NetWare* with Windows, provided us with some help.

You can augment *LAA*'s information with other details: serial numbers, descriptions, warranty information, and so on.



Saber LAA Agent Toolkit, Version 1.0
Saber Software Corp., P.O. Box 9088, Dallas, TX 75209-9088; 800-338-8754, 214-361-8086.
List Price: Console program, \$695; 25-user Agent program, \$695, starter kit with console and 25-user Agent program, \$1,195, 100-user Agent program, \$2,495.
Requires: 640K RAM, 3MB hard disk space, DOS 3.0 or later.

In Short: In addition to LAN inventory, *Saber LAA Agent Toolkit* has a wealth of features that sets it apart from the other products reviewed here. We found its hardware inventory module promising, but it needs more polish. The package includes software metering, network event logging, file auditing, disk monitoring, an application scheduler, and a Microsoft Windows front end.

CIRCLE 504 ON READER SERVICE CARD

Once we had the program installed, *LAA* executed automatically from the System Login Script. Overall, it performed well on our tests, with one major problem: It consistently overreported the number of parallel ports on our test network's PCs. Instead of the actual number of ports, *LAA* reported the number that *NetWare* makes available to the PC, which is always three.

Largely because of its broad focus, *LAA* is expensive. The special introductory starter kit, which is the version we tested, includes the Console and a 25-user Agent program for \$1,195. Separately, the prices are much higher. The Console, which serves as a sort of shell for the hardware agent and the other agents, costs \$695. The agents themselves cost \$695 for 25 users and \$2,495 for 100 users.

If LAN inventory is all you want, *LAA* probably is not the right product for you. But if you're looking for a single solution that provides a wide range of management functionality, *Saber LAA Agent Toolkit* deserves a close look.

Kellyn Betts and Carol Ellison are frequent contributors to PC Magazine.



Your upgrade

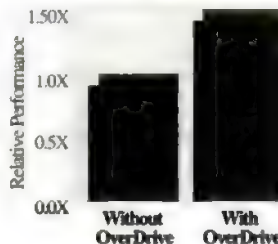
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by
Joe Salemi

Advisor

PORTABLE TAPE DRIVES

Could you please direct me to suppliers of portable tape backup units that use the parallel port, or the serial port at a high rate? It seems as though this should be possible, given all the file-transfer utilities that are available.

James L. Martin
New York, New York



Yes, it's possible, and a number of vendors do sell tape drives that can use the parallel or serial port. This portability comes at a price, though. All of the units I tracked down are considerably more expensive than units with the same capacities that are designed to use an internal interface. Also, units that attach to the serial port generally have a slower data-transfer rate than those that use the parallel port, and both are slower than tape drives that get the data through an internal card. Most of the tape drives listed here use standard 0.25-inch cartridge cassette tapes.

The least expensive unit that I came across in my search is the Funnel20 (Georgens Industries Inc., San Diego, Calif.; 800-255-5350, 619-481-8114; \$750), which uses the serial port and has a 40MB capacity. Valitek (Amherst, Mass.; 800-825-4835, 413-586-7408) has a number of serial-port units with different capacities. The PST-60 (\$1,695) supports up to 60MB, the PST-160 (\$1,995) up to 160MB, and the PST-250 (\$2,295) up to 250MB.

The Data-Logger (Analog and Digital Peripherals Inc., Troy, Ohio; 513-339-2241; \$1,295) uses minicassettes to back up 40MB and comes in both parallel-port and serial-port versions. Datasure Tape Backup Systems, a division of Datasure Technologies Inc. (Walnut Creek, Calif; 510-935-9899), makes two parallel-port units. The Datasure 60 (\$1,199) holds up to 60MB, and the Datasure 160 (\$1,499) up to 160MB. The TapeXchange (Interpreter Software Products Inc., Wheat Ridge, Colo.; 800-

- **PORTABLE TAPE DRIVES:** Parallel- and serial-port backup is available—but expensive.
- **FORMS-PROCESSING SOFTWARE:** Software packages that make it easy to create good-looking business forms.

232-4687, 303-431-8991; \$1,295) is another parallel-port tape backup that can handle up to 60MB.

If you're looking for high-capacity tape backup, the Data Vault series of drives (Magna Computer Corp., Salem, N.H.; 800-258-5528, 603-898-3555) uses 8-mm digital audio tapes (DATs) to hold from 1.3 gigabytes to 4.6GB. Prices range from \$19,995 to \$29,995, and the drives are available in SCSI, parallel, and serial versions. Colorado Tech Designs Inc. (Boulder, Colo.; 800-346-8858, 303-449-0963) makes the CTD/8L (\$19,500), a DAT drive that backs up 2GB and supports either the serial or QIC-02 interface.

FORMS-PROCESSING SOFTWARE

Where can I find inexpensive software to create all sorts of business forms on an HP LaserJet III printer? Preferably, the software should let me import drawings from various CAD, paint, and drawing programs.

Robert L. Swearingen
Chehalis, Washington



EZ-Forms Executive (EXZ Publishing, Houston, Texas; 713-280-9900; \$129) is a complete forms-processing system that supports the LaserJet printer, incorporates math functions and data merge, and can im-

port a number of different graphics files, including TIFF and .PCX. EXZ also offers *EZ-Forms Plus* (\$69), a simpler version, and *EZ-Forms Master* (\$189) for Windows 3.0.

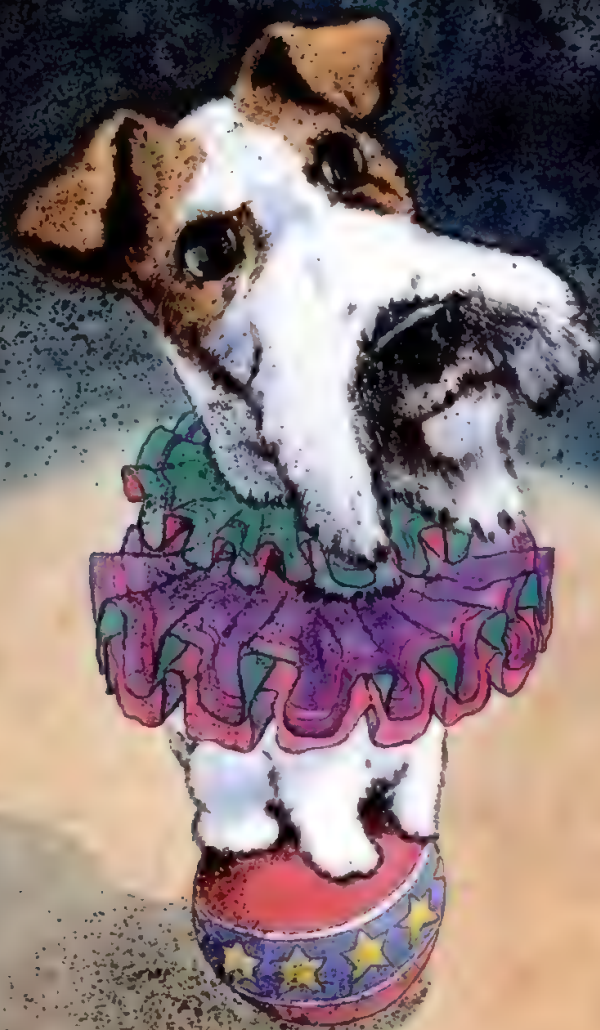
Delrina Technology Inc. (Don Mills, Ontario, Canada; 800-268-6082, 416-441-3676) publishes *PerFORM* (\$149), a DOS-based forms processor that includes a WYSIWYG interface to create the forms and a separate module for filling them in. It supports laser printers, dot matrix printers, and phototypesetters and can import TIFF, .PCX, .BMP, and EPS files, among others. *PerFORM Pro* (\$495), the Windows 3.0 version, comes with drivers that accelerate the printing speed. Another forms processor for Windows 3.0 you might want to check out is *JetForm-Design* (JetForm Corp., Ottawa, Ontario, Canada; 800-267-9976, 613-594-3026; \$495).

Finally, there's *FormWorx* (149.95) and *FormWorx for Windows* (\$299), from FormWorx Corp., a subsidiary of Power Up Software Corp. (San Mateo, Calif.; 800-851-2917). Both of these products are forms designers, and the latest versions have fill-in capabilities. The two programs can import .PCX and TIFF files, and they come with a number of predefined forms that you can use just as they are or modify. These two programs are available directly from the Power Up catalog.

If you would like more information on these types of products you should check out the reviews of forms software that appeared in the November 12, 1991, issue of *PC Magazine*.

ASK THE ADVISOR

Send your question to PC Advisor, One Park Ave., New York, NY 10016; to MCI mailbox PC MAGAZINE; or upload it to PC MagNet (see the instructions for joining on page 10 of this issue). We regret that we are unable to acknowledge submissions or answer letters individually. ■



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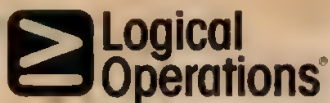
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Jeff Proise

Tutor

PAUSING CONFIG.SYS EXECUTION

Is there any way to pause execution of CONFIG.SYS the way you can pause AUTOEXEC.BAT? Messages scroll off the screen so quickly when CONFIG.SYS is processed that it's difficult to catch errors.

Duane Schenone
Toms River, New Jersey

PC There is no equivalent of the batch PAUSE command for CONFIG.SYS, but you can make one with the DEBUG script shown in Figure 1. The code creates a device driver named PAUSE.SYS which, when executed, displays the screen message "Press any key to continue . . ." and then pauses until a key is pressed.

Using DEVICE=, install PAUSE.SYS in your CONFIG.SYS file wherever you want DOS to pause in executing it. For example, say CONFIG.SYS currently contains the commands

```
DEVICE=C:\DOS\HIMEM.SYS
```

```
DEVICE=C:\DOS\EMM386.EXE
```

```
L=2848 2848 ram
```

■ **PAUSING CONFIG.SYS EXECUTION:** Here's how to create a device driver that brings the batch-file pause capability to CONFIG.SYS.

■ **UPPER MEMORY ON LESS POWERFUL PROCESSORS:** The utilities here can create upper memory blocks on 286 and earlier machines that use EMS hardware, employ special chip sets, or have integrated EMS capabilities.

```
DEVICEHIGH=C:\DOS\SMARTDRV.SYS
```

```
1024 512
```

```
DOS=HIGH,umb
```

```
FILES=40
```

```
BUFFERS=10
```

```
SHELL=C:\DOS\COMMAND.COM
```

```
C:\DOS /s:256 /p
```

and in order to check for error messages you want a pause after EMM386.EXE and again after SMARTDrive. Modify CONFIG.SYS to read

```
DEVICE=C:\DOS\HIMEM.SYS
```

```
DEVICE=C:\DOS\EMM386.EXE
```

```
L=2848 2848 ram
```

```
DEVICE=C:\DRIVERS\PAUSE.SYS
```

```
DEVICEHIGH=C:\DOS\smartdrv.sys
```

```
1024 512
```

```
DEVICE=C:\DRIVERS\PAUSE.SYS
```

```
DOS=HIGH,umb
```

```
FILES=40
```

```
BUFFERS=10
```

```
SHELL=C:\DOS\COMMAND.COM
```

```
C:\DOS /s:256 /p
```

(Naturally, if PAUSE.SYS is stored somewhere other than in C:\DRIVERS, you should modify its DEVICE= commands accordingly.)

After PAUSE.SYS runs, it removes itself from memory so that it takes no RAM away from your applications. When you no longer need it, remove PAUSE.SYS from your CONFIG.SYS file, or, if you're using DOS 4.0 or 5.0, comment it out with a REM statement.

PAUSE.SCR

```
A 0100
DB 77,77,77,77
DW 0000,003A,0045
DB "PAUSE",20,20,20
DB 0,0,0,0
DB $D,$A,"Press any key to continue . . .",$D,$A,0
CS:
MOV WORD PTR [12],BX
CS:
MOV WORD PTR [14],ES
RETF
;Device driver interrupt routine
PUSHF
PUSH AX
PUSH SI
PUSH DI
PUSH DS
PUSH BP
PUSH CS
POP DS
LES DI,[12]
ES:
CMP BYTE PTR [DI+2],0
JNZ $16A
CALL $177
ES:
MOV BYTE PTR [DI+$D],0
ES:
MOV WORD PTR [DI+$E],0
```

COMPLETE LISTING

```
ES:
MOV WORD PTR [DI+10],CS
ES:
MOV WORD PTR [DI+3],100
POP BP
POP DS
POP DI
POP SI
POP AX
POPF
RETF
MOV SI,16
CLD
LODSB
OR AL,AL
JE $18C
MOV AH,0E
INT 10
JMP $17B
MOV AH,0
INT 16
RET
M PAUSE.SYS
RCX
SD
W
Q
```

Figure 1: This DEBUG script creates a device driver, PAUSE.SYS, that pauses the execution of your CONFIG.SYS file.

UPPER MEMORY ON LESS POWERFUL PROCESSORS

I run DOS 5.0 on a 286 with 1MB of RAM. Are there products I can use to load TSRs and device drivers into upper memory? If so, would it help to add another megabyte of RAM to my PC?

N. T. Khandan
Mississauga, Ontario
Canada



One of the deficiencies of DOS 5.0's EMM386.EXE is that it requires a 386 or better. With a 286 you're forced to look elsewhere if you want to create upper memory blocks (UMBs) into which you can load TSRs and device drivers.

Yes, there are drivers that will create UMBs on 286s—some 286s, anyway. Generally, they require either a 286 built around one of the few chip sets the drivers support or a system containing EMS 4.0 expanded memory. In fact, you may not even need a 286. With EMS 4.0 memory available, most of these products will work on an 8086 or 8088.

286 memory managers currently on the market include:

■ **QRAM**, from Quarterdeck Office Systems. Similar to **QEMM-386** but designed for systems using processors earlier than the 386, **QRAM** can use EMS 4.0 expanded memory or hardware based on EEMS (the Enhanced Expanded Memory Specification, which preceded EMS 4.0). **QRAM** can also work with PCs built around Chips & Technologies' NEAT, LEAP, AT/386, or SCAT chip sets. It creates UMBs using the shadow RAM these devices provide.

In addition to **QRAM** itself, you get a slew of other utilities including **Manifest** (an excellent system information reporter), **VidRAM** (a TSR that converts RAM on EGA and VGA video adapters to conventional memory), and what Quarterdeck calls "DOS resource programs"—utilities that let you relocate (to upper memory) the areas of RAM with sizes controlled by the FILES, FCBS, BUFFERS, and LASTDRIVE statements in CONFIG.SYS.

■ **Move 'Em**, from Qualitas. When you buy **386MAX**, Version 6, you also get **Move 'Em**, which is similar to **QRAM** in that it supports systems containing EMS 4.0 hardware or built around Chips & Technologies' chip sets. Sometimes EMS support is built right into a ma-

chine's system board. **Move 'Em** supports the AST Premium 286, the AST Bravo 286, and the Compaq SLT and LTE series without additional hardware.

■ **UMB_DRV.RSYS**, a shareware program that exploits features of 286 and 386 chip sets to provide DOS 5.0-compatible UMBs. **UMB_DRV.RSYS** supports 46 different chip sets ranging from Chips & Technologies' NEAT to VLSI Technology's SCAMP, with more being added every day. Significantly, however, **UMB_DRV.RSYS** offers no support for EMS 4.0 hardware.

You can get a copy of **UMB_DRV.RSYS** by downloading it from Library 1 (DOS Utilities) of the IBM Sys/Utilities Forum on CompuServe. Simply type GO IBMSYS at the CIS prompt, then look for the **UMBDVR.EXE**—a self-extract-

286-specific drivers are generally inferior to their 386 counterparts, but they do run slightly faster.

ing archive containing everything you need.

According to the program's author, Chris Blum, future versions will feature a general EMS simulator that can convert your system's XMS (extended) memory to expanded memory.

Each package brings its own peculiarities to the task of interfacing with DOS 5.0. **Move 'Em** has you omit the DOS=UMB statement from CONFIG.SYS and use utilities it supplies to load TSRs and device drivers high. In contrast, **UMB_DRV.RSYS** asks you to add a DOS=UMB statement to CONFIG.SYS (as if you were using EMM386.EXE), then do your program loading with DOS 5.0's LOADHIGH and DEVICEHIGH commands.

QRAM gives you a choice. To load programs and drivers high without the DOS=UMB declaration, you must use the LOADHI utilities supplied with **QRAM**. If you do specify DOS=UMB,

you have the choice of using **QRAM**'s LOADHI programs or LOADHIGH and DEVICEHIGH. To Quarterdeck's credit, LOADHI utilities work in either configuration.

Although the 286-specific drivers are generally inferior to their 386 counterparts, they offer a few advantages. For example, they run slightly faster than 386 memory managers because they allow the CPU to remain in real mode. 386 memory managers use the processor's Virtual 86 mode; this imposes a penalty on performance, which can be severe with certain types of software. If you run floating-point packages in Virtual 86 mode without the benefit of a math coprocessor, your PC will run noticeably slower. Worse, some programs are incompatible with Virtual 86 mode. But such packages usually run fine with 286 memory managers. Finally, some products geared to 286s let you do things that 386 packages don't. **UMB_DRV.RSYS**, for example, lets you load HIMEM.SYS in upper memory.

NetRoom, from Helix Software, is another excellent memory manager that supports PCs of all types. It runs on any PC that contains expanded memory—even EMS 3.2. If you have a 386 or 486 that has extended but not expanded memory, **NetRoom** will use that, too. Among other features, **NetRoom** swaps TSRs and device drivers in and out of DOS's address space on the fly. On the outside, it looks as if several programs are sharing the same memory space. **NetRoom** is certified to work with **NetWare**, **VINES 3.x** and **4.x**, **LAN Manager**, **LANtastic**, **3Com LAN** software, and **IONET**.

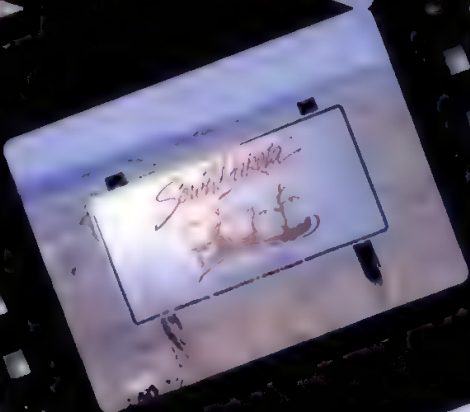
Would adding another megabyte of RAM to your PC help? Probably not. Most of these memory managers require no more than 256K of additional memory. Adding RAM would help, however, if you use Microsoft Windows or if you run applications that are capable of using the extra memory. It never hurts to have more than you need.

ASK THE TUTOR

The Tutor solves practical problems and explains techniques for using your hardware and software more productively. Questions about DOS and systems in general are answered here. Send your question to Tutor, *PC Magazine*, One Park Ave., New York, NY 10016, or upload it to PC MagNet (see page 10 for instructions). ■

THE SEARCH IS OVER...

As our story continues, we find Dakota Smith, dashing young scientist, and Lexa Kirk, independent journalist, nearing their destination. Both are searching for the secret source of the perfect portable PCs.



Cow!

Are From Gateway 2000!



Dakota and Lexa—Gateway 2000 employees Phil and Mary—were photographed in Beautiful Rushmore Cave near Keystone in the Black Hills of South Dakota.

"Now it's our mission to tell the world about our discovery!"

Dakota pauses. In all the excitement, he has forgotten that Lexa's dream remains unfulfilled.

"I'm sorry, Lexa," Dakota tries to comfort her. "I know you were hoping to find something different — more like a cross between a notebook and a palmtop."

"You're right. These are excellent machines, but they're not quite what I was hoping for," she murmurs.

"But wait!" Dakota shouts, his voice echoing through the cave. "There's another map loaded on my Nomad."

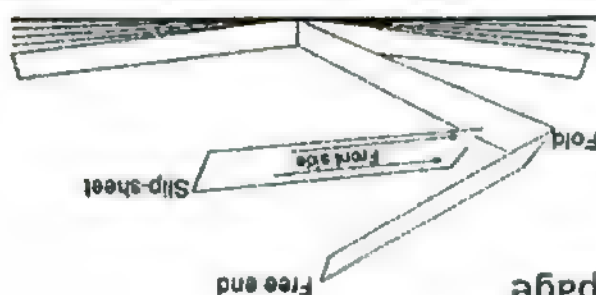
Yes, more directions. And the arrow is pointing to something called the HandBook. Do you suppose...?" he wonders.

Dakota and Lexa hurry out of the cave. What they thought was their journey's end has turned out to be just the beginning.

TO BE CONTINUED...



"What is not a friend in the business."



1. Open the foldout page
2. Insert this sheet with
 1. Front side touching the free page
 2. Arrow pointing to the fold
 3. Slice the folded edge
 4. Close the page and slip-sheet

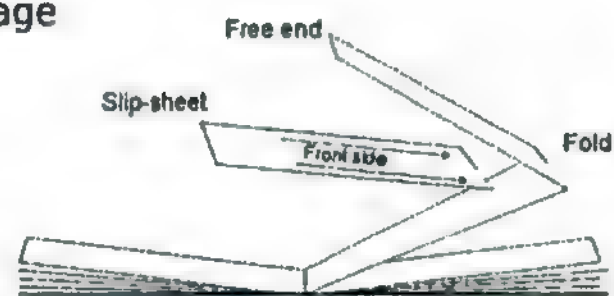
Inverted Foldout slip-sheet



Folded edge of the page

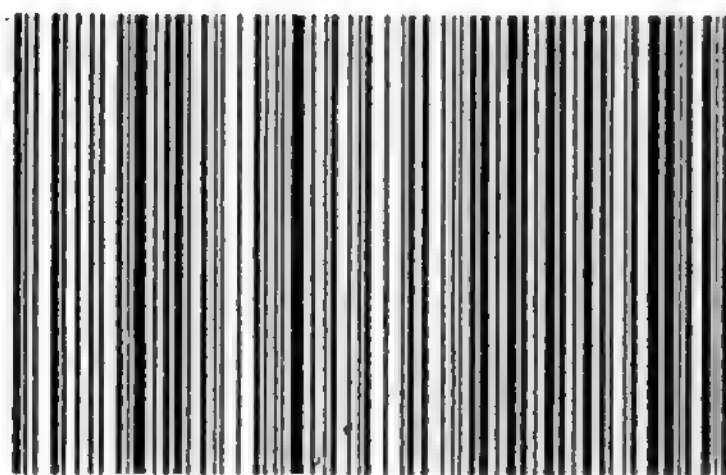
Foldout slip-sheet

1. Open the foldout page
2. Insert this sheet with
 1. Front side touching the free page
 2. Arrow pointing to the fold
 3. Slice the folded edge
 4. Close the page and slip-sheet



1. Follow instructions on the other side

Inverted Back



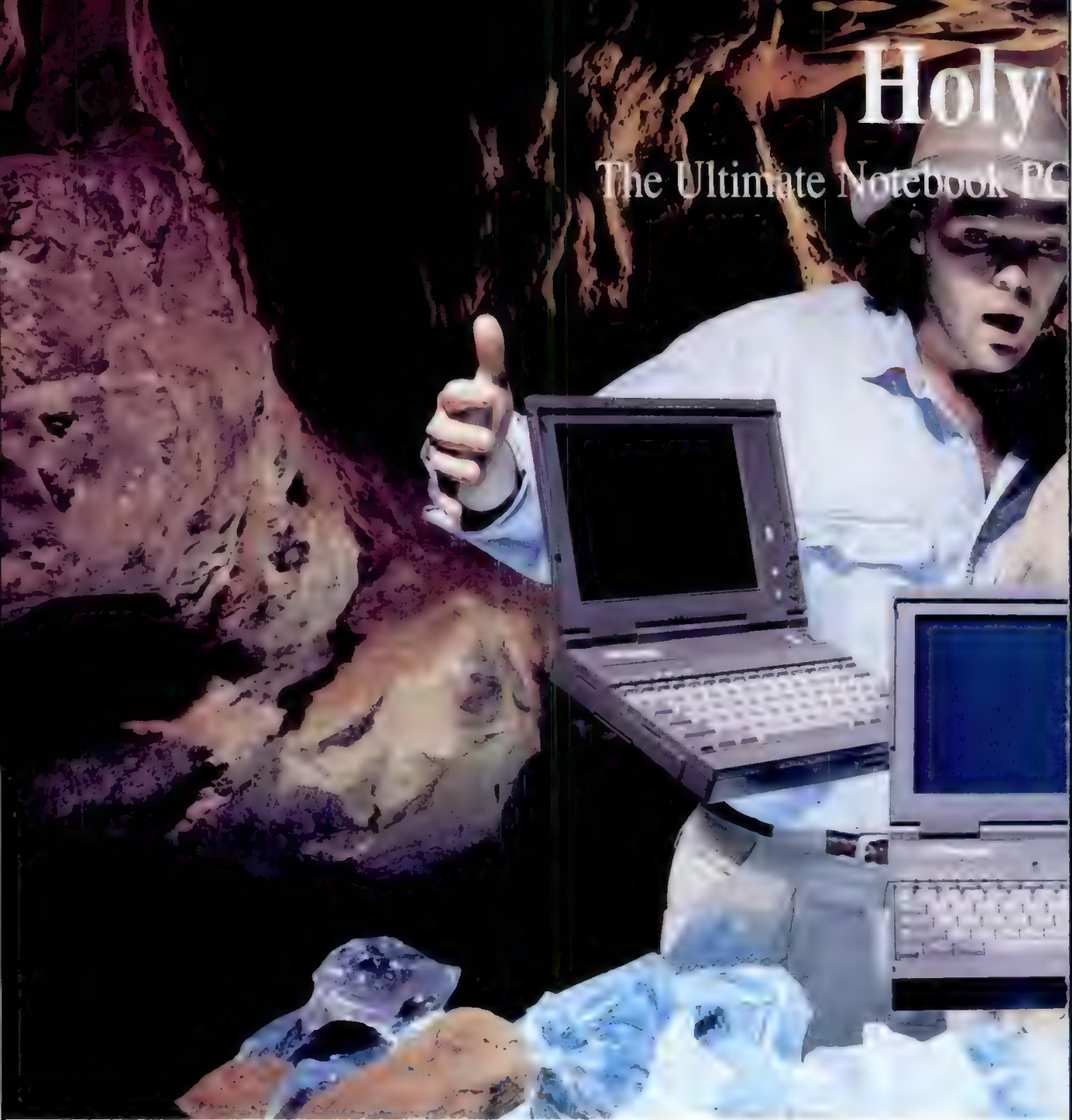
GbsSlpBack-0018

Back

1. Follow instructions on the other side

Holy

The Ultimate Notebook PC



Deep inside a mysterious cave, Dakota and Lexa discover three notebooks called the Nomad Series.

NOMAD They're Dakota's dream come true — notebooks designed for serious computing on the road, all with supernatural battery life, great screens and keyboards, in a compact, lightweight model.

Dakota can't help wondering how these astonishing little machines got here. "They must have been placed in the cave by some ancient civilization advanced beyond our time, or

perhaps by beings from another galaxy," he surmises. Lexa, always probing for the truth, points out that the notebooks are clearly marked with the Gateway 2000 logo. Dakota is not satisfied. "Why would Gateway 2000 keep these wonderful notebooks hidden from the world?" he wonders.

"It must be a conspiracy!" Lexa exclaims. "An evil competitor must be behind this! The people at Gateway must have sent us the clues to discover their treasures so we could tell the world!"

"I think you're on to something, Lexa," Dakota agrees.

The Explorers' Notes

PC Magazine says, "Desktop PCs are faster (than notebooks)... That was before we found the Nomads!"

The Nomad notebooks we discovered are highly unusual. Our theory is they were designed to let you take desktop computer performance anywhere you go in a small, lightweight

notebook. These systems are every bit as powerful as their desktop counterparts. And with patented power management features, the Nomads also have some hard-to-beat battery life

benchmarks. We got almost seven hours of operation from a single battery on the 25MHz 486DX system. The Nomad power management system includes a 5.7 amp/hour battery and patented power-saving BIOS and software features.

The backlit, 10-inch VGA Nomad screens are bright and crisp. Resolution is 640 x 480, 64 gray scale, on the LCD. With 1MB video RAM, you can also display 1024 x 768 resolution on a monitor simultaneously.

There's another Nomad characteristic that sets these notebooks apart from most others. They're made in the U.S.A.!



- Weight 5.8 Lbs. (Nomad & Battery)
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- 7-Hr.* NiCad 5.7Ah Battery
- 14.4-Oz. Battery Charger, 6.12" x 2.25" x 1.5"
- Traveling Weight 6.7 Lbs. (Nomad, Battery & Charger)
- Backlit 10" VGA Screen, 640 x 480 Resolution, 64 Gray Scale
- Simultaneous Video with 1MB
- 1.44MB 3.5" Diskette Drive
- 1 Parallel/1 Serial Port
- External Video & Expansion Bus Ports (Ports are Full Size)
- 79-Key Keyboard, 101-Key Emulation, Inverted T Cursor Pad
- Pointing Device
- MS DOS® 5.0 & Windows™ 3.1

Nomad Options: 2,400 bps and 9,600 bps modems, portable printer, numeric keypad, expansion station, Token Ring or Ethernet interfaces, SCSI interface, memory upgrades, executive carrying case, extra batteries

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 - 80MB Hard Drive
- \$1995**

NOMAD 420SXL

- 20MHz, Intel® 486SX Processor
 - 4MB RAM
 - 80MB Hard Drive
- \$2795**

NOMAD 425DXL

- 25MHz, Intel 486DX Processor
 - 4MB RAM
 - 120MB Hard Drive
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All prices and configurations are subject to change without notice. Prices do not include shipping.

* Battery life was measured using PC Magazine's Battery Rundown Test with power management enabled. Actual results may vary depending on configuration and applications.
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by
Neil J. Rubenking

User-to-User

UNDERSTANDING REDIRECTION

Immediately following the `PATH=` command in my `AUTOEXEC.BAT` file, I use the command

```
PATH > OLDPATH.BAT
```

to create or overwrite the file `OLDPATH.BAT` containing my default `PATH`. It's handy to be able to reestablish the default path simply by typing `OLDPATH`, in the event the path was changed for some reason.

In the process of writing a batch file to use `OLDPATH.BAT`, I've discovered what I believe to be a DOS problem. This problem exists in both DOS 4.01 and 5.0; I haven't checked earlier versions.

Figure 1 shows batch file lines that illustrate the problem and the method I used to work around it. These lines are simply intended to create the `OLDPATH.BAT` file if it doesn't already exist, but the efficient-looking single-line solution creates a 0-byte file instead. As a point of interest, the command in question works properly if redirected to a printer instead of a file. I'd like to know why the command doesn't work.

Ray Pizar
Tempe, Arizona



You'll see the same effect in any version of DOS, but it isn't a bug. To understand why the line in question doesn't behave as you would

■ **UNDERSTANDING REDIRECTION: DOS initializes redirection before executing commands. This can cause surprising results.**

expect, you have to know just what DOS goes through when evaluating a batch line. First, DOS replaces any environment variables or replaceable parameters with their values. Then it initializes the files for any redirection requests on the line. Finally, DOS executes the command. Here's the offending line:

```
IF NOT EXIST OLDPATH.BAT  
PATH>OLDPATH.BAT
```

There are no replaceable parameters or environment variables, so the first thing that DOS does is look for redirection. Yes, there's a request to redirect the output of the `PATH` command into a file called `OLDPATH.BAT`, so DOS opens that file. If the file doesn't exist, DOS creates it; if it does exist, DOS wipes out its contents. `OLDPATH.BAT` is a blank slate, a 0-byte file ready to receive output from somewhere.

Now DOS gets around to evaluating the `IF` test that comprises the line's main

command. Whether or not `OLDPATH.BAT` existed *before* this line was reached, it exists *now* because DOS just created it. Thus the `IF NOT EXIST` test will never be true, and `OLDPATH.BAT` will remain a 0-byte file. Mr. Pizar's solution to this problem is exactly right: Use more than one batch line, so the file whose existence you're testing does *not* get created by the very line that performs the test.

In that same vein, DOS evaluates redirection before executing `FOR` loops. Thus, you cannot write a `FOR` loop that will involve redirection to a file specified by the `FOR` variable. For example, the following line does *not* create 0-byte files named A, B, and C:

```
FOR %%F IN (A B C) DO REN > %%F
```

Rather, it creates one file called "`%%F`" three times. And this next line will *not* redirect all `.TXT` files in the current directory through the `MORE` filter:

```
FOR %%F IN (*.TXT) DO MORE < %%F
```

If you're in a situation that seems to require redirection based on the value of the `FOR` variable, you can usually use a secondary batch file instead. The line above could be replaced by

```
FOR %%F IN (*.TXT) DO CALL  
MORETEXT %%F
```

This method requires a new batch file `MORETEXT.BAT` containing the single line `MORE < %1`.

SHARE YOUR SECRETS

Reveal your latest DOS and systems discoveries through *User-to-User*; we'll pay you \$50 for any submission we print. Please submit your letter on-disk together with a printout. Mail your contribution to *User-to-User*, *PC Magazine*, One Park Ave., New York, NY 10016, or upload it to PC MagNet. ■

REDIRECT.BAT

```
SECHO OFF  
REM This works  
IF EXIST OLDPATH.BAT GOTO Skip  
ECHO OLDPATH.BAT did not exist - creating it.  
PATH>OLDPATH.BAT  
:Skip  
REM Deleting OLDPATH.BAT for demo purposes  
DEL OLDPATH.BAT  
REM This does NOT work  
IF NOT EXIST OLDPATH.BAT PATH>OLDPATH.BAT  
DIR OLDPATH.BAT  
ECHO OLDPATH.BAT has been reduced to a 0-byte file!
```

Figure 1: This batch file demonstrates the problem inherent in testing for the existence of a file that is created on the same line as the `IF EXIST` test.

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by
Fran Finnegan

Windows

MODIFYING .INI FILES EASILY

I long ago abandoned Program Manager for *The Norton Desktop for Windows*, but some programs refuse to work correctly unless Program Manager is the shell. Specifically, certain application installers don't like anything but PROGMAN.EXE to be the shell specified in the [boot] section of the SYSTEM.INI file.

For this reason, there are times when it would be nice to have a different Windows shell without having to edit SYSTEM.INI or WIN.INI manually. It is a nuisance to edit those files manually and then reboot; I'd at least like to automate the process a bit. I would copy different backup versions of SYSTEM.INI and WIN.INI over the originals in the main Windows directory, but I am afraid of destroying more up-to-date information in the originals.

Do you know of a way to start Windows with a shell of my choice, without manually editing SYSTEM.INI first? Ideally, it would be great if Windows allowed me to switch shells dynamically (on the fly), but I don't imagine 3.1 will include that feature. Any thoughts?

John Sientz

Glendale, California

PC Quite a cottage industry has evolved in writing utilities that let you choose from different sets of CONFIG.SYS/AUTOEXEC.BAT pairs for different DOS environments. *PC Magazine* offers MBOOT, and there must be dozens of shareware programs. Is it possible to do the same with Windows and its SYSTEM.INI/WIN.INI files? The answer is yes, but the required procedure is quite different.

Here's the problem: The difference between the DOS CONFIG.SYS/AUTOEXEC.BAT files and Windows' SYSTEM.INI/WIN.INI files is that the DOS files are relatively static and the Windows files are quite dynamic. By *static*, I mean that the contents of your CONFIG.SYS/AUTOEXEC.BAT files



are determined by you once and are seldom changed by the programs you run. By *dynamic*, I mean that the contents of your SYSTEM.INI and WIN.INI files (as well as all the other .INI files found in your main Windows directory) are frequently modified by programs running under Windows. While CONFIG.SYS and AUTOEXEC.BAT are procedural or executable in their formats, the .INI files are formatted to allow applications to store textual variables. It is impossible to maintain multiple versions of the .INI files accurately, because you can't replicate changes that a Windows program may make to the current version you're using in the other copies of that .INI file.

The only safe way to solve this problem is to update the current version of an .INI file; this is most often done with a text file editor, such as Notepad. I faced the same situation several years ago, but I wanted to be able to modify .INI files quickly without having to edit them with a text editor. My solution was to write a program, INI.EXE, that would allow me to modify .INI files from DOS. INI is executed at a DOS prompt or in a .BAT file. It uses the following syntax:

INI file section key value

The *file* parameter is the filename of any .INI file that you are changing. The format of .INI files is detailed in WIN.INI.TXT in Windows 3.0 and WIN.INI.WRI in 3.1, which is in your main Windows directory.

The *section* parameter is the name of the section within *file* that you are changing. Although section names have square brackets ([]) around them in the actual .INI file, it is not necessary to include the square brackets around this section name on the command line when you run INI.

The *key* parameter is the name of the variable within the *section* that you are adding, changing, or deleting. The *key* is the part of an .INI file entry that appears on the left side of the equal sign. And *value* is the text string that the *key* is being set to. The *value* appears on the right side of the equal sign. To remove an entry, set *value* to "nul" on the .INI command line.

If *section*, *key*, or *value* contains blanks or other punctuation, the parameter should be enclosed in double quotation marks. By following this standard DOS convention, the entire double-quoted string is considered by DOS to be a single parameter. For example, "PCL / HP LaserJet,HP PCL,LPT1:" is a possible *value* for the "device" *key* in the "windows" *section* of the WIN.INI file.

When INI executes, it creates a new version of *file* as *.TMP; when it successfully updates the *.TMP file, it renames *file* to *.BAK and then renames *.TMP to *file*. Using ERRORLEVEL, INI returns 0 if successful, 1 if there is a parameter error, and 2 if *file* was not updated successfully. As an example, to change the shell= entry in your SYSTEM.INI file's [boot] section to PROGMAN.EXE, you would run INI as follows prior to starting Windows:

ECHO OFF

```
INI SYSTEM.INI boot
shell progman.exe
```


SOLUTIONS WINDOWS

```
IF ERRORLEVEL 2 GOTO NotUpdated
IF ERRORLEVEL 1 GOTO ParameterError
WIN
GOTO End
:NotUpdated
ECHO INI could not update the file.
GOTO End
:ParameterError
ECHO Parameter error in INI
:End
```

You will, of course, insert other lines into your .BAT file, or use different .BAT files, to control whether or not a particular .INI-file line is updated by INI. This aspect of controlling .BAT files and their execution is common in the DOS world.

As a further example, I run INI in the .BAT file I use to start up Windows 3.1 in the following way, to keep the order of my Program Manager group icons fixed the way I want them to be:

```
INI PROGRAM.INI Settings Order * 2
3 4 5 6 7 8 1
```

WIN

If you use this kind of batch file and then add or delete groups, it's absolutely necessary to update the batch files.

Modifying the current .INI files this way assures you that you aren't accidentally affecting any other changes made by applications. INI changes only the line it's asked to change, which is the safest thing to do considering the dynamic nature of .INI files. All you have to make sure of is that you are setting the *value* to something that makes sense.

You are correct in being afraid to copy different versions of SYSTEM.INI and WIN.INI—or any .INI file—over your originals. Numerous readers have submitted tips that suggest that you copy backup or similar .INI files over the current ones as a way to maintain or set up a particular environment. This kind of copying is *not* a good idea! The various .INI files change often as you run your Windows applications, so copying a backup or similar .INI file over the most recent "live" version may wipe out information that an application recently updated. Duplicates of .INI files should be used *only* as a backup and should be reverted to only in cases where it is absolutely necessary; the contents of these backups will seldom be current.

Until there's a Windows utility available that offers you a choice of shells at

runtime (and Windows 3.1 doesn't include one), INI or a similar program is probably the best way to choose your shell quickly. INI is available on PC MagNet in the Utilities/Tips Forum in Section 10 (Windows).

CHANGING PRINTER DRIVERS

We frequently want to change printer drivers in Windows 3.0 to best accommodate the program in use at the moment. For example, our *Excel* spreadsheets need the standard HP LaserJet driver, but we want to use the PostScript driver when we use *Microsoft Word for Windows*. Changing back and forth between the two is cumbersome, since you have to go through the Control Panel, which is time-consuming and nonproductive.

We hit upon an alternative method. The WIN.INI file (in the main Windows directory) contains the printer selection; that file is modified whenever the printer selection is changed in the Control Panel. We simply copied the appropriate WIN.INI file to the *Excel* directory and to the *WinWord* directory. Extra lines were added to the two respective .BAT files that load *Excel* and *WinWord*:

```
COPY C:\EXCEL\WIN.INI C:\WINDOWS
```

and

```
COPY C:\WINWORD\WIN.INI C:\WINDOWS
```

Thus, when the two batch files run, the proper printer driver is loaded.

Richard L. Watson
Webster Groves, Missouri



This technique may work, but it's dangerous, for the reasons noted in the response to the preceding letter. A lot of programs store information, such as a user's preferences or most recent settings, in WIN.INI. If you copy what is essentially a backup version of WIN.INI over the current version of it, you may be wiping out changes made by some of your applications. At some point you may regret doing this, such as when some program doesn't work as expected.

There are at least two better alternatives to this approach. First, both *Excel* and *WinWord* contain a Printer Setup command under the File menu. This command allows you to change your de-

fault printer in just three mouse clicks. Execute the command, click on the printer of your choice, and click on the OK button. *Excel* and *WinWord* will then update WIN.INI for you. This is the safest alternative.

If you still do not want to go to that effort, a second alternative exists. You can use the INI program, which is described in the response to the previous question, in your .BAT files instead of using the COPY commands.

For example, in Windows 3.0 you can specify the HP LaserJet driver with the following commands in your *Excel* .BAT file:

```
INI WIN.INI windows device "PCL / HP LaserJet,HPCL,LPT1:"
```

```
INI WIN.INI devices "PCL / HP LaserJet" "HPCL,LPT1:"
```

```
INI WIN.INI devices "PostScript Printer" "PSCRIPT,None"
```

WIN EXCEL

You can specify the PostScript driver with the following commands in your *WinWord* .BAT file:

```
INI WIN.INI windows device "PostScript Printer,PSCRIPT,LPT1:"
```

```
INI WIN.INI devices "PCL / HP LaserJet" "HPCL,None"
```

```
INI WIN.INI devices "PostScript Printer" "PSCRIPT,LPT1:"
```

WIN WINWORD

Both of these examples presume that the WIN.INI [windows] NullPort entry is set to None, and that your printer is on the LPT1: port. You will need to modify the examples I have just presented if that is not the case.

Other possibilities for accomplishing your goal include using the Recorder or macros in *Excel* and *WinWord*, but both of those are more difficult than the solutions mentioned here.

OPENING WINDOWS

Share your Windows experience; we'll pay you \$50 for any tip we print. Mail your contribution on-disk with a print-out, to Windows, *PC Magazine*, One Park Ave., New York, NY 10016, or e-mail it (re: PC Magazine) to PC MagNet: 76244,145; MCI Mail: Fran Finnegan; BIX: franfinnegan; GENie: finnegan; Internet: finnegan@well.sf.ca.us. We regret that we are unable to answer questions individually. ■

by
Craig Stinson

Spreadsheets

SUMMING OUTLINE CELLS

I have fallen in love with the outliner in *Microsoft Excel 3.0* and use it regularly when I want to see only certain levels of detail in a worksheet. One thing that is annoying, however, is the absence of any way to tell *Excel* to sum just the cells at a particular outline level. I figured out a rather complex formula for summing only a particular range of cells—a formula that uses the *INDIRECT*, *TEXT*, and *CELL* functions to assemble the reference I need as a concatenated text string. But I'm wondering if there isn't an easier way.

Dale Shaw

Auckland, New Zealand

PC There is. In *Excel 3.0*, you can sum the cells at a given outline level (excluding the hidden cells) by using the Select Visible Cells tool on

■ **SUMMING OUTLINE CELLS:** If you need to restrict a sum to just one outline level in *Excel*, here's how.

the toolbar. Suppose you have the simple outline shown in Figure 1. In cell R5, you want a formula that adds the four quarterly totals in row 5. Typing `=SUM` and waving the mouse across E5 to Q5 won't do, because *Excel* will give you `=SUM(E5:Q5)`—and the result will include all the intervening (hidden) columns. But you can do the following: Click the Autosum tool, click the Visible Cells tool (the fifth button from the left

on the toolbar), then press Enter.

When you hit the Visible Cells tool, *Excel* changes the formula from `=SUM(E5:Q5)` to `=SUM(E5,I5,M5,Q5)`, which is exactly what you want. This procedure, incidentally, allows you to exclude any hidden cells from a range—whether or not you're using an outline. If you've just used formatting (rather than outlining) commands to hide rows or columns and want to skip over the hidden data with a formula reference, the Visible Cells tool is your best friend.

Unfortunately, the standard toolbar on the just-announced *Excel 4.0* does not include the Visible Cells tool. If you're upgrading and do a lot of work with outlines, you might want to consider adding it to the standard toolbar. If there's some other tool in the default arrangement that you don't need, you can lop it off to make room for Visible Cells. Alternatively, you can click the right mouse button on the standard toolbar. That will pop up the menu of *Excel 4.0*'s supplementary toolbars, which is shown in Figure 2. From this menu, you can choose "Microsoft Excel 3.0" to display *Excel 3.0*'s toolbar.

Excel's Select Special command includes an option to select only the visible cells in a range. But, unfortunately, you can't get to this command while you're in the middle of building a formula. So without the toolbar, there's no simple way to eliminate the hidden cells from a selection.

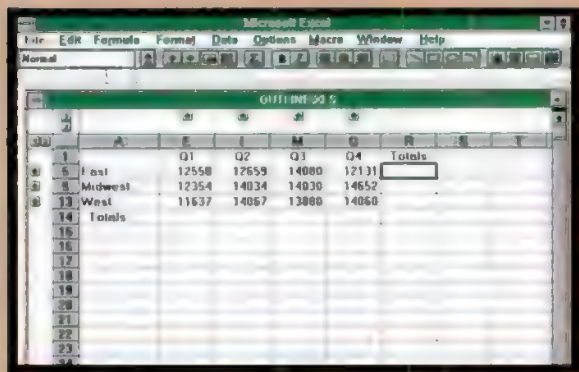
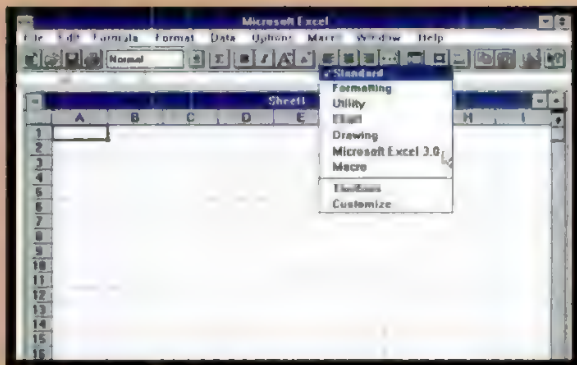


Figure 1: This *Excel 3.0* screen shows an outline with the Select Visible Cells tool highlighted.

Figure 2: This menu appears when you click the right mouse button on *Excel 4.0*'s standard toolbar.



HINTS, TIPS, QUESTIONS

Share your latest spreadsheet discovery through *PC Magazine*'s Spreadsheets column. We'll pay you \$50 for any tip we print. Please submit your letter on-disk, together with a printout. Mail your contribution to Spreadsheets, *PC Magazine*, One Park Ave., New York, NY 10016, or upload it to PC MagNet (see page 10 for access instructions). We regret that we are unable to answer letters individually.

by
M. David Stone

The Working Word

VARIATION ON PAGE FRAMING

The Working Word column that appeared in the January 14, 1992, issue of *PC Magazine* shows how to create a frame around a page in *WordPerfect* by using a graphics box in a header. As shown, however, the technique uses the default paragraph anchor, when it might better use a page anchor.

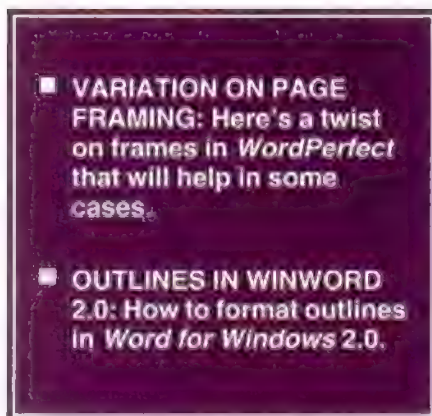
The paragraph anchor behaves just like a paragraph of text, which is why you have to adjust the margins before and after the header. You adjust them before the frame to make the margins smaller, so that the graphics box can print closer to the edge of the paper. You readjust them after the frame to return the margins to their starting position.

The page anchor, by contrast, will let you place an image anywhere in the printable area on the page—inside or outside the margins. That means you can create a frame using the page anchor without adjusting the margins at all.

To frame multiple pages in a document, go to the beginning of the text, press Shift-F8 (format), then choose Page, Headers, Header A, and Every Page to go to the Header A editing screen. Next, create the graphics box. Press Alt-F9 (graphics); choose Figure, Create, and set the Anchor Type to Page, and press Enter to accept the default skip zero pages.

The remaining settings depend on how big you want the box to be. If you have standard 1-inch margins all around and you want the frame to be 0.25 inches away from the text on all sides, you'll want the box to be 0.75 inches from the edge of the page. That means the upper-left corner should be 0.75 inches from the left and 0.75 inches from the top of the page. The frame should measure 7 inches wide (8.5 inches minus 0.75 inches on each side) and 9.5 inches high (11 inches minus 0.75 inches on the top and bottom).

Start by anchoring the upper-left corner of the frame. Choose Vertical Posi-



tion, then Set Position, and enter the offset from the top of the page as 0.75 inches, followed by Enter. Next, choose Horizontal Position, then Set Position, and enter the offset from the left of the page as 0.75 inches, followed by Enter. Choose Size, then Set Both, and enter 7 inches for the width and 9.5 inches for the height. Finally, set Wrap Text Around Box to No, and exit to the document screen by pressing F7 three times.

If the editing screen is not already split to show codes, press Alt-F3. Check to make sure the Header A code is before any text, including spaces and hard returns. That's all there is to it. By defining the frame with the page anchor, you don't need margin settings before or after the header code. So what took five codes with the paragraph anchor now needs only one.

Kelly P. Merrill
Orem, Utah



This is a valuable modification to the procedure, but you should keep in mind that it won't entirely eliminate margin settings unless you're using the standard margin settings for the text.

The first page of the example in the January 14 column had a 2-inch margin for the text and a box that framed the text at 1.75 inches from the edge of the paper. If you use the page anchor to replicate

that example, you'll still need codes for setting the top and bottom margins and the left and right margins for the text to 2 inches. Otherwise the text will still print with the default 1-inch margin, which means the frame will print inside the text margins.

Some people consider minimizing the number of codes on-screen desirable in itself because it makes for a cleaner screen when *WordPerfect* is set to reveal codes. Having fewer codes, however, also means you're minimizing the amount of information on the Reveal Codes screen.

If you use a paragraph anchor for the frame and set the margins before and after the header, you can tell at a glance how large the text area and frame are: Simply press Alt-F3 to reveal the codes and then read the margin settings on the screen. If you use the page anchor, you have to press Shift-F8; choose Page, Header, Header A, Edit; then press Alt-F9 and choose Figure, Edit, Figure 1. Of course, in either case you can see what the page looks like by pressing Shift-F7 (View Document), but that's not the same as seeing the settings.

In short, using the page anchor saves a little work when setting up the frame, but it creates work if you need to check the settings. This probably won't be much of an issue if you're using standard 1-inch margins for the text and only one format for the frame and text throughout the document. But if you're varying the text area and frame sizes on different pages, as in the example we presented in the January issue, this extra information can be useful. I prefer to invest the work in the beginning so I will have the information where I can easily see it, but that's ultimately a matter of personal taste.

OUTLINES IN WINWORD 2.0

As a recent convert from *WordPerfect* 5.1 to *Microsoft Word for Windows* 2.0, I sorely miss *WordPerfect*'s outline fea-

ture. In *WordPerfect*, you can place an automatically numbered outline in the middle of a document simply by pressing Shift-F5, then choosing Outline, On (to mark the beginning of the outline), and pressing Shift-F5, Outline, Off (to mark the end). *WordPerfect* will automatically number each paragraph between the two markers. It will also let you move a paragraph up or down a level in the outline with the Tab or Shift-Tab keys, and it will automatically renumber the paragraphs as you make changes.

In *WinWord*, it seems the only way to produce an outline with automatic numbering is to use the outliner that is part of the Outline View. That means a lot of extra work, since you then have to change fonts for the special heading styles the outliner uses. It also means that every line of the outline will appear in the document's table of contents. Is there any way to produce a simple, automatically numbered outline in *WinWord* as you can in *WordPerfect*?

Bill Todd
Mt. Prospect, Illinois



While there isn't an exact equivalent, creating a numbered outline format in *WinWord* 2.0 is actually not as complex as Mr. Todd suggests. The feature to use, however, is Bullets and Numbering, not the collapsible outliner.

You can create the outline you need by typing it as you would any other text, using the Normal style all the way through if you like. To indicate that any given paragraph is at a lower level in the outline than the one before it, define the paragraph with an indent from the left so that it's indented further than the paragraph before it. Note that you must set the indent as part of the paragraph definition. Indenting with a tab won't work.

After you finish writing the text, highlight everything you want as part of the outline, then choose Tools, Bullets, and Numbering, press the Outline button, and choose a numbering format. If you want a hanging indent on each paragraph, choose the Hanging Indent check box and set the size. Then make sure that the Start At text box shows the appropriate starting number (usually 1), make sure that the Auto Update and Replace Only Numbers check boxes are not checked, and choose OK. *WinWord* will return you to the editing screen and add outline numerals to the highlighted text.

That's the basic procedure. Now for some ways to automate it. To start, you can use the Indent and UnIndent buttons on the toolbar, or use shortcut keys, such as Ctrl-N and Ctrl-M, as an easy means of changing the indentation for any given paragraph or selection of paragraphs.

You can also automate the highlighting step by using a bookmark to define the outline text. Highlight the text once, then define a bookmark with the Insert Bookmark command. This lets you highlight the text again at any time by choosing Edit GoTo, or pressing its equivalent shortcut key (F5), and entering the bookmark name.

You can even record a macro that sets the outline options the way you want them and then attach the macro to a toolbar button, a Menu, or a shortcut key. Adding or updating the numbers then becomes a simple matter of highlighting the text and running the macro.

A more sophisticated approach to creating indents is to use styles to assign the correct level of indentation to each paragraph. Simply create a set of styles that are independent of the Heading styles and define a different level of indentation for each style.

Since you'll probably want these styles available in most documents you work with, it's a good idea to put them in the Normal template. You can do that from within a document, but it's easiest if you open the template file and create the styles in the template. To open the Normal template, choose File Open, select Document Template in the List Files Of Type box, and then select NORMAL.DOT from the *WinWord* program directory.

(If you've never saved any global changes in *WinWord*, you won't have a NORMAL.DOT on-disk. In that case, you'll have to create one. Choose File New, followed by Template in the New box, Normal in the Use Template box, and then OK. Immediately choose File Save As to save the file in the *WinWord* program directory, using any name you choose. Next, close all files in *WinWord* and rename the file to NORMAL.DOT. You can then open the file and edit it.)

From within NORMAL.DOT, choose Format Style, then Define, and enter a style name. If you like, you can also assign each style you create to a shortcut

key, using the Shortcut Key box in the Style dialog box.

After you've entered the name, make sure the Based On box shows the style you want to base the new style on. You'll probably want to base all your styles on the Normal style so that if you make a change in Normal—changing the font, for example—the change will automatically be reflected in them.

Next, choose the Paragraph button, set the Indentation From Left to the size you want, choose OK, then choose Add To Template. Repeat this procedure for each level of outline style you create. When you're finished, choose Close to leave the Style dialog box. Make sure you haven't accidentally typed anything into the editing screen or changed the style for the first paragraph (it should still be Normal). Then choose File Close, answer Yes when *WinWord* asks whether to save the global changes, choose OK to accept the name NORMAL.DOT in the Save As dialog box, and answer Yes when *WinWord* asks whether you want to replace the existing NORMAL.DOT.

The styles you've just created will be available to any new files you create. For older files, however, you'll need to add these styles to the files' stylesheets explicitly.

CORRECTION

In the May 26, 1992, column, an insert read

```
LeftChar 1
LockFields
RightChar 1
```

It should have read

```
CharLeft 1
LockFields
CharRight 1
```

TIPS FROM WORKING WORDSMITHS

Tell the Working Word your latest word processing discovery; we'll pay you \$50 for any tip we print. Please send your contribution on-disk, along with a print-out, to The Working Word, *PC Magazine*, One Park Ave., New York, NY 10016, or upload it to PC MagNet (see page 10 for access instructions). We regret that we are unable to acknowledge submissions or answer questions individually.

UDS brings more to the table in the V.32 *bis* modem game



Modems that comply with the CCITT V.32 *bis* recommendation (and there are lots of them) share some common characteristics: 14.4 kbps basic rate, with compressible automatic fallback speeds; V.42 *bis* and MNP[®] level 5 data compression; sync or async full-duplex operation over two- or four-wire circuits and Hayes "AT" auto-dialing.

As these similarities drive value-conscious modem buyers to look beyond the common features, the search for added performance advantages brings them to the UDS V.3229.

In addition to the "standards," UDS offers a suite of features—automatic dial back-up, remote configuration capability, call security etc.—that is simply not available in competitive models.

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Digicom 9624E +	38.4K						
Hayes Ultra 144	38.4K						
Microcom QX14232 <i>bis</i>	38.4K						
U.S. Robotics Courier V.32 <i>bis</i>	38.4K						
Telebit T3000	57.6K						

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UDS



CIRCLE 367 ON READER SERVICE CARD

by
Frank J. Derfler, Jr.

Connectivity

AS/400-TO-PC ALTERNATIVES

There are many ways to link a *NetWare* LAN to an AS/400 minicomputer. Options include attaching them directly over Token-Ring or Ethernet, hooking each PC right into the AS/400, or linking through either of two gateway types. Once you're physically connected, you can run IBM's *PC Support* software (since most AS/400 sites already have it) or go with a third-party solution.

IBM would like you to buy a Token-Ring adapter for your AS/400 and run 5250 terminal emulation software on each PC using a Token-Ring card. The Solutions Catalog Order Center (800-426-2255) will quote you a price of \$3,125 for an AS/400 Token-Ring adapter. The Order Center also sells Ethernet adapters for \$4,000, but since Ethernet lacks Token-Ring's performance, it isn't recommended.

If your current LAN is Ethernet but you want to take the Token-Ring route, no problem. Just establish a router in a *NetWare* server to combine the Ethernet PC links with a path to the AS/400 via Token-Ring. The primary advantage of connecting to your minicomputer via Token-Ring is that Token-Ring doesn't require adding expensive twinax ports to the AS/400.

You can equip every networked PC with a twinax adapter, load 5250 terminal emulation software, and connect directly to the AS/400 from each PC. The average retail price of the boards, sold by the same companies that market gateways (see below) ranges from \$300 to \$395. Since you can attach up to seven terminals—or PCs acting as terminals—to each AS/400 twinax port, you can daisy-chain the wiring to keep costs down. This means, however, that you'll have two cables going to each PC: one for the LAN plus twinax for the mini. You'll also need enough twinax ports on the AS/400 to service all the PCs that could ever be on simultaneously.

LAN gateways hold down costs and

■ **AS/400-TO-PC ALTERNATIVES:** Options abound for connecting PCs to AS/400 minicomputers.

let you share twinax port connections. You set up one PC on the network as a gateway to the AS/400. An older 286 system will do; you don't need a new computer. One twinax adapter in the gateway machine provides the only connection to a single port on the AS/400, giving the gateway access to 7 AS/400 sessions, which it distributes to the networked PCs on a first come, first served basis. You can put as many as 3 twinax adapters in the gateway, so it can give simultaneous access to 21 PCs.

The leading vendors of twinax gateways and adapters for individual PCs include Andrew Corp., AST Research, Emerald Systems, IDEAssociates, and Micro-Integration Corp. Micro-Integration is better known by its old name, Bluelynx, and serves as Novell's *NetWare* 5250 Gateway supplier. (As of this past February, Novell transferred responsibility for the product back to Micro-Integration.) The competitive price point for all these gateway products is \$1,995. That buys you a twinax adapter, gateway software, and a 5250 terminal emulation program that runs on each networked PC.

Frankly, the choice between these attachment schemes is a matter of economics. How many twinax ports have you already bought for the AS/400? If you have a lot of ports standing idle, either the direct-attachment or gateway approach looks appealing. Do you have a spare PC you can use as a gateway to further reduce the cost? Is it more economical to add a Token-Ring adapter to the AS/400 than to buy more twinax

ports and individual twinax boards for each PC? It may be more cost-effective to add a Token-Ring adapter to the AS/400 and establish a Token-Ring link to a router than it is to create a gateway between the Ethernet LAN and twinax ports. You need only do some simple addition to come up with the numbers for each attachment alternative.

IBM's *PC Support* software consists of a package for the AS/400 and another for the PC. The avowed purpose of the system is to provide IBM's Advanced Program-to-Program Communications (APPC) services between programs running on the PC and those on the AS/400. Few organizations have real APPC applications, though, so *PC Support*'s most common function is to move files between PCs and the AS/400. I'm not qualified to comment on the AS/400 side of the package, but I'm told that AS/400 system managers run it only when they need to perform a specific job.

The PC side of *PC Support* needs a total rewrite. It doesn't work with Windows or OS/2 and it takes up a lot of RAM. In IBM's defense, the company made a smart move by marketing Wall Data's *Rumba* as a Windows front end to *PC Support*. (See "3270 Emulation the Easy Way Under Windows 3.0," February 26, 1991). The *Rumba* front end, sold by IBM as the \$395 *Rumba/400*, lets you use Windows' multitasking capabilities, cut and paste between Windows applications, and access a context-sensitive help system. There are other alternatives to *PC Support*, but since this software is so common, you'll probably learn to live with it.

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CIRCLE 144 ON READER SERVICE CARD

by
Craig Kerwien

PC MagNet

Despite the cost-saving utilities and information on PC MagNet, there are some people who do not go on-line because it costs money. We call this the *clink reflex*: some people can hear a coin dropping with every minute spent on-line. In fact, we heard about the clink reflex so often we decided to take action.

Starting May 1, a number of on-line services will be free of connect-time charges in exchange for a small membership support fee. This way, members don't have to worry about spending money every time they go on-line. For just \$2.50 a month, all current and new members of PC MagNet and ZiffNet will not be charged for time spent on the main menu and will get the following services free:

- the ability to download the current *PC Magazine* utility;
- ZiffNet Product Reviews Index (GO ZNT:REVIEWS), an index to product reviews published by *PC Magazine*, *PC/Computing*, and *PC Week*;
- Buyers' Market (GO ZNT:MAR-KET), a new buyers' service with current specs, prices, and ordering information on more than 10,000 products sold by direct merchants (see below for more details);
- Product Award Listings (GO ZNT:EDCHOICE), the latest *PC Magazine* Editors' Choice and Technical Excellence award winners, plus the annual awards from *PC/Computing* and *MacUser* the day after they're announced;
- weekly computer industry news from *PC Week* and *MacWEEK* (GO ZNT:PCWNEWS), still updated on the Friday night *before* the print edition arrives in your mailbox;
- ZiffNet Highlights (GO ZIFFNET), which are updated daily and tell you what's new on the service and what's happening in the industry; and
- ZiffNet Support Forum (GO ZNT:SUPPORT), providing answers and assistance for ZiffNet navigation.

We recently sent out a copy of Ziff-

■ **KEEPING COSTS DOWN:**
How to save money when
using our on-line services.

Net Threads, a newsletter for all ZiffNet and PC MagNet members that provides an updated ZiffNet Road Map as well as a coupon for getting the ZiffNet User Manual and Software Guide. (If you don't get this in the mail, you can download it from the Software/Utilities Library. The filename is ZTHD1.EXE.) If you're new to on-line services, you may also be interested in the ZiffNet edition of the CompuServe Information Manager (CIM), which is the same as the regular CIM except that we've customized some of the menus and windows for ZiffNet. ZiffNet CIM is available for downloading (GO ZNT:CIMORDER), or you can fill out the coupon in the ZiffNet Threads newsletter.

This membership support fee and associated benefits will apply to all members starting May 1. If you haven't used the service recently, you'll be asked to confirm your membership during your next session.

BUYERS' MARKET

Buyers' Market is a new ZiffNet buying service for personal computer systems and products that are available from vendors and mail-order companies. Buyers' Market is a comprehensive and up-to-date database containing product specs and prices and vendor-supplied information. Free of connect-time charges, the database currently contains information for more than 10,000 products from 130 companies, all indexed and searchable.

Suppose, for example, you want to buy a laptop computer. After reading the review in the April 14, 1992, issue of *PC Magazine*, you decide to further investigate three products. You can search

Buyers' Market for actual specs and current prices, and you can use the forums to ask other ZiffNet members what they think of these products and see how they stack up. The listings also include important service and warranty information so you can find out about on-site service, toll-free phone support, money-back policies, and the like.

MORE MONEY-SAVING TIPS

■ While you can use a terminal-emulation program such as *ProComm Plus* or *Crosstalk* to access ZiffNet, we suggest using automated access packages such as *CIM*, *TAPCIS*, and *ATO*, which simplify and speed up access.

■ Plan your on-line session. Know where you want to go. Take a look at the ZiffNet Road Map to see your destination. If you're still not sure where to find something, go to the ZiffNet Support Forum and ask.

■ Ask questions before you buy a product. The *PC Magazine* editorial staff can usually be found in the Editorial Forum (GO ZNT:EDITOR). Typically, you'll see an answer from another member soon after you post your message.

■ Be informed. Know what new products are released and learn about their vices and virtues. The News areas are a good source of information, as are the message forums. Ignorance is not bliss in this industry.

■ Watch the New Uploads sections for inexpensive tools that can solve an immediate problem. The PC Magazine Tips/Utilities Forum provides quick access to downloadable software, including the *PC Magazine* utilities provided in every issue. An easy way to watch the traffic is to download a copy of the forum catalog UTFSUM.EXE, which has one-line descriptions of every utility in the forum. This file is updated monthly.

In short, lose the clink reflex and enjoy on-line services for what they are: a cost-effective way to get the information and software you need. ■

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CIRCLE 192 ON READER SERVICE CARD

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by
Douglas Boling

Utilities

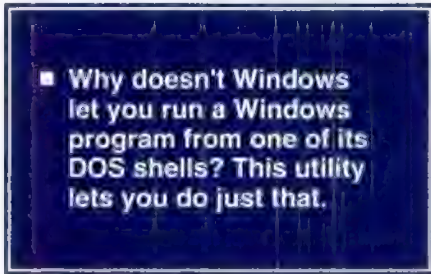
Load Windows Programs From the DOS Prompt With WINSTART

Microsoft Windows is a great environment for computer users, but it does have its idiosyncrasies. For me, the most glaring omission from Windows is its inability to recognize when a Windows program is executed from the DOS command line in a DOS window. Why does the program display the message "This program requires Microsoft Windows" when Windows is already running?

To start a Windows program, you must first switch to the Windows desktop, pull down the File Run menu in the File Manager, and type the program name. Alternatively, you can take the time to create an icon in the Program Manager window using the File New menu command. It would be much easier if Windows simply recognized its own programs from the DOS command line. Even the much-maligned OS/2 can recognize its own programs and automatically switch from an OS/2 command line to the desktop and execute the requested program.

WINSTART and its companion program WINGO let you start Windows programs from the DOS command line. WINGO is a small DOS TSR that you install before Windows; WINSTART is a Windows application that gives WINGO access to the necessary Windows API (application programming interface) functions. The two programs communicate with each other to provide the WINSTART functionality. Because of the design of Windows, you can only use the WINSTART/WINGO combination if you run Windows in 386 Enhanced mode.

Using WINSTART/WINGO is simple, and once installed the programs are transparent to the user. WINGO is best installed by a statement in the AUTOEXEC.BAT file. Once installed, WINGO examines every program you execute from the DOS command line. If you attempt to launch a Windows program, it automatically starts Windows. Once Windows is running, WINGO needs a way to tell Windows that a program needs to be launched on the desktop. This is where



■ Why doesn't Windows let you run a Windows program from one of its DOS shells? This utility lets you do just that.

WINSTART comes into play.

WINSTART is best launched using the LOAD= line in WIN.INI or in Windows 3.1 by placing the WINSTART icon in the start-up Group in the Program Manager. Once launched, WINSTART sits quietly as an icon at the bottom of the Windows desktop.

Once both programs are running, typing any Windows program name at a DOS prompt will cause Windows to switch to the desktop and start that program. Since Windows is started in tandem with the running of the DOS box, the DOS prompt will return and a second or two will elapse before the screen is switched to the desktop. This delay occurs because Windows is swapping the DOS session to the disk and restoring the desktop.

You can disable and reenab WINGO and WINSTART when you want. To disable the combination at the DOS prompt (regardless of whether Windows is running), simply type

```
WINGO /D
```

Using the /E option reenables WINGO. If you are in Windows, you can disable the programs via the Disable option on the

WINSTART icon's System menu and reenab WINSTART with the Enable option. Since WINSTART and WINGO work as a pair, disabling one disables the other and enabling one enables the other. Disabling WINGO/WINSTART is handy when you are running the Windows SETUP program from the DOS command line. If you do not disable the programs, the Windows part of SETUP will run instead of the desired DOS-based Windows SETUP.

An About option on the WINSTART icon System menu displays the WINSTART About box containing the copyright notice. Double-clicking on the WINSTART icon also displays the About box. The WINSTART icon never restores to a full window. When you terminate Windows, you can unload WINGO using the /U command line option.

You can download WINGO and WINSTART from PC MagNet as WINGO.COM and WSTART.EXE. The sidebar "Downloading Utilities" gives instructions for downloading files. The source code for both programs is also available by downloading the files WINGO.ZIP and WSTART.ZIP. WINGO requires an assembler compatible with MASM 5.0, while WINSTART requires Microsoft C 6.0 and the Windows SDK (Software Development Kit) to compile. If you do not have a modem, you can get a disk with the executable and source for both programs directly from *PC Magazine*. Send a postcard with your name, address, and preferred floppy format to the attention of Katherine West, Utilities, *PC Magazine*, One Park Ave., New York, NY 10016. No phone calls, please.

A LOOK INSIDE WINGO/WINSTART

Due to the complex and somewhat convoluted design of Enhanced-mode Windows, you need two programs just to start Windows programs at the DOS command line. WINGO monitors the DOS EXEC function call to determine when a Windows program is launched. WINSTART gives WINGO the ability to use the Windows function WinExec so that Windows can launch the desired program. Both programs are relatively simple; it is their interdependence and communication methods that are interesting.

WINGO is a simple TSR that hooks the DOS command interrupt (INT 21h) in order to monitor calls to the DOS EXEC function, and the DOS Multiplex interrupt (INT 2Fh) to monitor Windows and communicate with WINGO.

Unlike most TSRs, WINGO never pops up, so its code can be quite simple. When you execute WINGO, it checks for DOS 3.1 or later, determines if WINGO itself has already been installed, and parses the command line. If you execute WINGO under DOS 1.x or 2.x, it simply prints a

Unlike most TSRs,
WINGO never pops up,
so its code can be
quite simple.

message and terminates. If WINGO has not been installed, it installs itself by hooking the two interrupts (21h and 2Fh) and reserves enough memory for its code and data buffers. WINGO refuses to install if Windows is already running. For reasons explained below, WINGO must be installed before Windows is started.

To determine if it has already been installed, WINGO uses the Multiplex interrupt and the application-available device IDs between C0h and FFh. The standard Multiplex interrupt call consists of a

Device ID in AH and a command in AL. Device IDs 0 through 0BFh are reserved by Microsoft, leaving the remaining 64 device IDs for all other application programs to use. Since so few device IDs are available for applications, WINGO can't randomly assign itself one; it must find an unused device ID.

To determine if any program is using a given device ID, WINGO places the ID in AH, clears AL, and calls the Multiplex interrupt. If a program using the ID is installed, it places a 0FFFFh in AX and returns. WINGO checks each device ID starting with C0h until it finds itself or an unused ID. If it finds an unused ID first, WINGO assumes it isn't already installed.

Since other programs can be using application device IDs, WINGO must determine whether the program responding to an install check is an installed copy of WINGO or another program. To provide verification, the installed copy of WINGO returns the memory segment of the installed code in ES when it responds to the install check. The transient copy of WINGO compares the first 16 bytes of the installed segment with its own code segment. If the segments match, the responding installed program must be WINGO.

The Multiplex interrupt can be used for more than just an installation check: WINSTART also uses it to communicate with WINGO.

Once resident, WINGO monitors all INT 21 calls. If a program uses the DOS EXEC call (INT 21 AX=4B00h) to start another program, WINGO checks what type of program is to be started. If the program is a .COM or DOS .EXE file, WINGO just passes the call to DOS. If the program is a Windows .EXE file, WINGO jumps into action. The trick for WINGO is to determine whether the program is a DOS or a Windows program.

There are two types of DOS executable programs: .COM files and .EXE files. (.BAT files are simply commands to be executed by COMMAND.COM and therefore aren't started through the DOS EXEC function.) .COM files came from the old CPM operating system; a .COM file is simply an image of the program as if it were already in memory. When you launch a .COM file, DOS creates a program segment prefix (PSP) in memory, then loads the file directly into memory above the PSP. A .COM file's maximum size is 64K.

.EXE files are more complex. Each

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The *PC Magazine* utilities are available by modem from PC MagNet, a ZiffNet service hosted by CompuServe.

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DOS .EXE file includes a header that tells DOS how to load the file into memory. .EXE files can contain multiple segments for code and data. DOS identifies an .EXE file not by its extension but by the first two bytes in the .EXE header: MZ (for Mark Zbikowski, one of the early DOS programmers). An .EXE file can be much larger than 64K.

Windows .EXE files are even more complex than their DOS counterparts. The new .EXE header was originally developed years ago by Microsoft for a multi-tasking version of DOS sold only in Europe. The same header format is used in Windows and OS/2. The new .EXE format is actually two programs in one: a DOS program complete with an old-format DOS .EXE header and a Windows or OS/2 program with its own new .EXE header.

Normally, the DOS program embedded in a Windows file just prints the annoying message "This program requires Microsoft Windows." (OS/2 programs obviously print a slightly different message.) Some files, such as Windows SETUP.EXE, do contain complete DOS and Windows programs.

Figure 1 shows the layout of a standard .EXE header. The header includes the initial entry point and stack pointer as well as information on how to load the different segments into memory. You should note the identifying MZ in the first two bytes of the file. If the file is a new .EXE,

the standard DOS header is extended with additional information, including a pointer to the new .EXE header.

To determine if the program being launched is a Windows program, WINGO first determines if the file has an old .EXE header by looking for the MZ identifier. If it finds the MZ, WINGO examines the

The new .EXE header format is actually a DOS program and a Windows or OS/2 program in one.

first segment-relocation pointer at offset 18h. If this pointer is greater than 40h, indicating that the old .EXE header contains the extra data, then a pointer to the new .EXE header can be found at offset 3Ch.

WINGO reads the presumed new .EXE header from the file using the pointer from offset 3Ch in the old header. Figure 2 shows a layout of the new .EXE header,

which is identified by the letters NE (new executable) at offset 0. While the header provides a complex description of the .EXE file, WINGO is only interested in the target operating-system field at offset 36h. If the file is a Windows .EXE, bit 2 of the byte is set. (For a complete description of the Windows and OS/2 segmented .EXE header, read Appendix D of *Advanced OS/2 Programming* by Ray Duncan; Microsoft Press, 1988.)

Once it has found a Windows program, WINGO checks to see whether Windows is running. If not, WINGO searches the path for the file WIN.COM and starts Windows using the EXEC command with the name of the requested Windows program passed as an argument on the command line. This appears to Windows as if you had typed WIN WINPROG.EXE from the command line. Windows then launches the requested Windows program after it starts.

If Windows is already running, a much more complex process is required to launch the Windows application. Before delving into how WINGO and WINSTART launch a Windows application, another digression is necessary to discuss how Enhanced-mode Windows works.

Figure 3 shows a typical memory layout for a PC running DOS. As with all computers based on Intel processors running in real mode, the interrupt table starts at address 0:0. Above the interrupt table is the BIOS data area, the DOS kernel code, and any DOS device drivers. Above the device drivers are any TSRs loaded by the user. In this example, two TSRs are loaded: WINGO and a generic TSR labeled TSR1. Above the TSRs is COMMAND.COM, and above COMMAND.COM is conventional memory available to DOS applications. At the address A000:0, 128K is usually reserved for any video cards installed in the system. Above the video segments are any upper memory blocks (UMBs), adapter RAM and ROM, and, finally, the BIOS ROM.

Above the conventional memory at 10000:0 is extended RAM, which is only available to the system when the processor is running in protected mode. Although some programs, notably DOS extenders from companies such as Ergo Computing, Phar Lap Software, and Rational Systems, allow programs to run in extended memory under DOS, extended RAM is used mainly for RAM disks and disk-cache buffer storage. While programs can use a BIOS call to switch to pro-

THE OLD .EXE HEADER		
Offset	Contents	Comment
00	'M'	Signature byte
01	'Z'	Signature byte
02	Header length	MOD 512
04	File length	MOD 512
06	Relocation table size	Size of relocation table
08	Header size	MOD 16
0A	Minimum memory size	Minimum memory needed MOD 16
0C	Maximum memory size	Maximum memory needed MOD 16
0E	Starting SS	Relative to start of file
10	Starting SP	
12	Checksum	Checksum of .EXE file
14	Starting IP	
16	Starting CS	Relative to start of file
18	Relocation table offset	Pointer to relocation table
1A	Overlay number	Byte value for old .EXE file
1C	Reserved	
24	OEM identifier	Present only in new .EXE file
26	OEM information	Present only in new .EXE file
28	Reserved	
3C	Pointer to new .EXE header	Present only in new .EXE file

Figure 1: This is the format of the old DOS .EXE header. Note that the header fields below offset 18h are present only if the header is in a new .EXE file.

ected mode, none of the standard operating-system functions, such as memory allocation or interrupt handling, are available.

When you start Windows, the memory allocation above the installed TSRs changes drastically. The program WIN.COM determines the type of processor in the system and the available memory so that it knows what mode Windows should run in. If it detects an 80386 processor or better and at least 2MB of available memory, WIN.COM starts WIN386.EXE, the Enhanced-mode Windows kernel.

Enhanced-mode Windows utilizes two very important features of the 386 processor that DOS simply ignores. First, Enhanced-mode Windows runs in the protected mode of the processor, allowing Windows applications to access up to 16MB of RAM.

The second feature used by Enhanced-mode Windows is the V86 mode of the 386. When in V86 mode, the 386 can simulate any number of VMs (virtual machines), each of which seems to have its own 8086 processor. Windows uses this mode of the 386 to simulate individ-

Since each DOS session runs in its own VM, WINGO cannot simply access protected-mode RAM to communicate with a Windows program.

ual real-mode DOS sessions.

Figure 4 shows Windows running in Enhanced mode with a number of V86 DOS sessions. Note that any TSRs installed before Windows are global to all V86 sessions in the system, while TSRs loaded after Windows are specific to the individual DOS session in which they

were installed. Another important detail is that Windows creates its own virtual machine called the system VM. Windows programs all run in protected mode in the system VM. DOS-mode programs, on the other hand, run in their own individual real-mode DOS VM.

Since Windows is running in protected mode, most of the Windows code, along with Windows applications, uses memory above the 1MB line in the system VM. TSRs, including WINGO, face two obstacles in accessing Windows applications like WINSTART. First, they must be able to access the system VM, and then they must be able to talk to a program running in protected mode. Fortunately, Windows provides the solutions to both of these problems.

Using the V86 mode of the 386 to create an individual virtual machine for each DOS application allows that application to use its DOS memory as it pleases, without competing with Windows for scarce real-mode RAM. Windows uses the paging features of the 386 to create separate "instances" of real-mode RAM for each of the V86 virtual machines. A DOS VM even has its own extended RAM. Programs that use a DOS extender to run in protected mode, such as *Lotus 1-2-3 3.1*, use the VM's extended memory. As with real-mode RAM, the extended RAM provided to the DOS session is not the same extended RAM used by Windows.

Since each DOS session runs in its own VM, WINGO cannot simply access protected-mode RAM to communicate with a Windows program such as WINSTART. Even if WINGO could find the memory segment where WINSTART is located, the extended memory of each DOS session is accessed using its own Local Descriptor Table (LDT). (The LDT cross-references 16-bit selector values with actual physical memory.) WINSTART is running in the system VM using the Windows LDT and so cannot be accessed. Since WINGO must talk to WINSTART to perform its task, it must find a way to switch to the system VM.

While it is not documented in the Windows SDK, a DOS API does exist to allow a DOS application to access some features of Windows by using the Multiplex interrupt with device ID 16h. This API is documented in the Windows Device Driver Kit (DDK) available from Microsoft. Windows programmers should have a copy of the DDK, if only for insights into how Windows works internally.

THE NEW .EXE HEADER		
Offset	Contents	Comment
00	'N'	Signature byte
01	'E'	Signature byte
02	Linker major version	
03	Linker minor version	
04	Entry table offset	Relative to start of new .EXE
06	Entry table length	
08	32-bit CRC	CRC of entire file
0C	Module flags	
0E	DGROUP segment number	
10	Size of initial local heap	
12	Size of initial stack	
14	Starting IP	
16	Starting segment number	Segment number of initial CS
18	Starting SP	
1A	Segment number of stack	
1C	Entries in segment table	
1E	Entries in module reference table	
20	Length of nonresident names table	
22	Offset of segment table	
24	Offset of resource table	
26	Offset of resident names table	
28	Offset of module reference table	
2A	Offset of imported names table	
2C	Offset of nonresident names table	
30	Number of movable entry points	
32	Size of file alignment unit	
34	Number of resource table entries	
36	Target operating system	
37-3F	Reserved	

Figure 2: This is the format of the new segmented .EXE header. The offsets to tables in the header are relative to the start of the new .EXE header.



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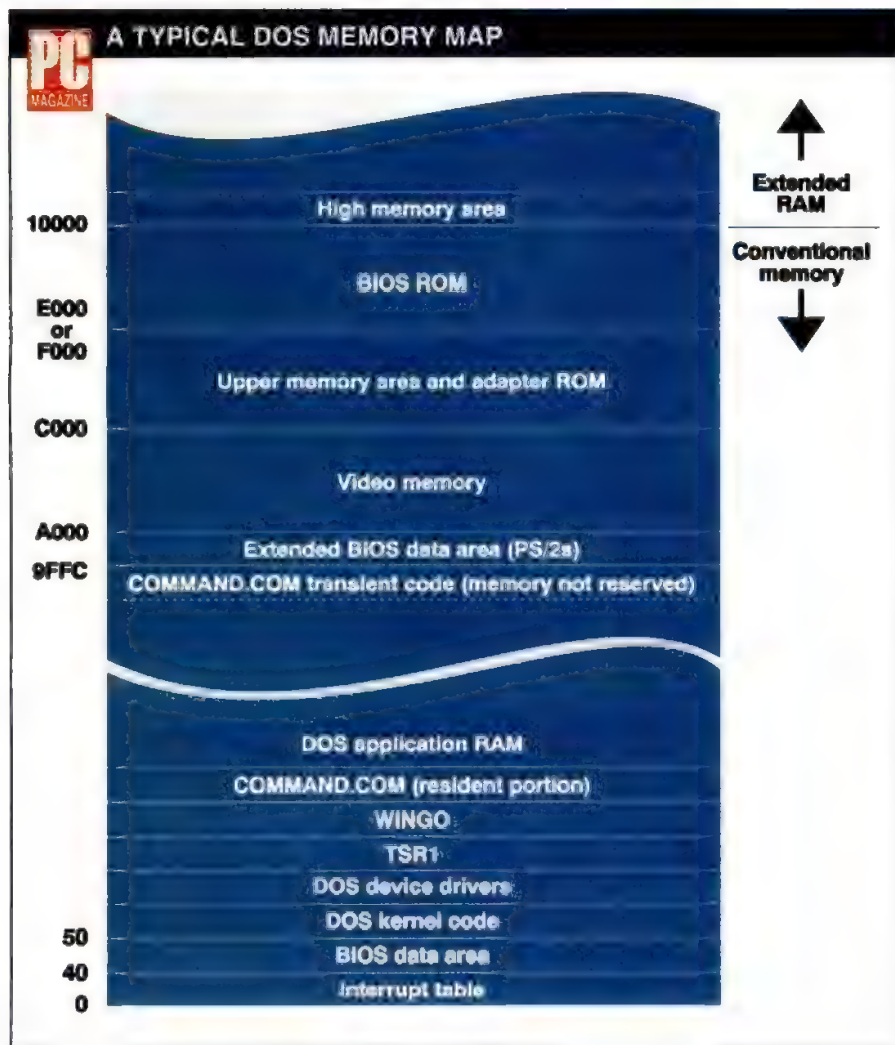


Figure 3: This illustrates how conventional memory is allocated on a typical DOS-based PC. Above conventional memory is extended RAM, which is only available to the system when the processor is running in protected mode.

Figure 5 shows the available functions using the DOS or Windows API. Windows makes some of the calls to notify DOS applications of events such as Windows starting and exiting. Other calls can be made by DOS applications to determine the status of the system. WINGO uses two of these calls to switch to the system VM.

When WINGO needs to launch a Windows application, it uses the Get VM ID call (INT 2Fh AX=1683h), which returns the current VM ID in BX. The ID is a number that indicates which of the virtual machines Windows is currently running. WINGO checks to see if the requested EXEC call is being made from the system VM. If so, WINGO assumes Windows is making the call and stays out of

the way. If the EXEC call is being made from another VM, WINGO switches to the system VM using the Switch VM and Callback function (INT 2Fh AX=1685h).

The Switch VM and Callback function switches the active VM to the VM requested in BX and calls the routine pointed to by ES:DI. Since Enhanced-mode Windows is a preemptive multitasking system, the execution priority of the newly active VM must be specified. WINGO uses the execution priority suggested in the VMM.INC file bundled with the DDK. Via the Switch VM and Callback function, WINGO tells Windows to switch to the system VM and call back to the WINGO routine Main.

WINGO makes the assumption that the system VM is VM 1. It must make

this assumption, because there isn't a call that WINGO can use to determine the system VM ID. Both Windows 3.0 and 3.1 use VM 1 as the system VM.

An interesting point is that the call to Switch VM and Callback returns before the routine pointed to by the call, Main, is actually called. The function simply schedules the call. So even though the routine Main is yet to be called in the System VM, WINGO returns from the DOS EXEC call with a successful return code. COMMAND.COM, or whatever program called the EXEC function, assumes the EXEC call was successful and continues. This is why the DOS prompt will return before the Windows program actually starts. When the Windows scheduler sees that the system VM has been scheduled, it switches to that VM and calls Main.

Special care must be taken in the routine called by the Switch VM and Callback function. When Main is called, the stack segment and pointer (SS:SP) are not pointing to the WINGO stack. All registers used by the callback routine must also be saved and restored before exiting. The routine is terminated with an IRET instruction.

INTERMODE COMMUNICATION

Once in the system VM, WINGO still faces a hurdle: It is a real-mode program attempting to communicate with a protected-mode program, WINSTART. WINSTART has a similar problem: How does a protected-mode program communicate with a real-mode program? Fortunately, Microsoft provided a back door that lets programs communicate across the real mode/protected mode gap.

When Microsoft designed Windows 3.0, it realized that formerly real-mode Windows 2.x programs now running in protected mode under 3.0 would still need to talk to code that ran in real mode: DOS, for example. To allow for this type of communication, Microsoft designed a new interface called the DOS Protected Mode Interface (DPMI). This low-level interface allows programs running in one mode to call routines operating in the other mode. Other functions allow memory buffers that map segment:offset addresses in real mode to selector:offset addresses in protected mode. (While a complete discussion of the DPMI is beyond the scope of this article, Ray Duncan discussed DPMI in a series of three Power Programming columns starting in the Feb-

HOW WINDOWS RUNS A DOS SESSION

Note: The top of extended RAM for VMs depends on .PIF file settings.

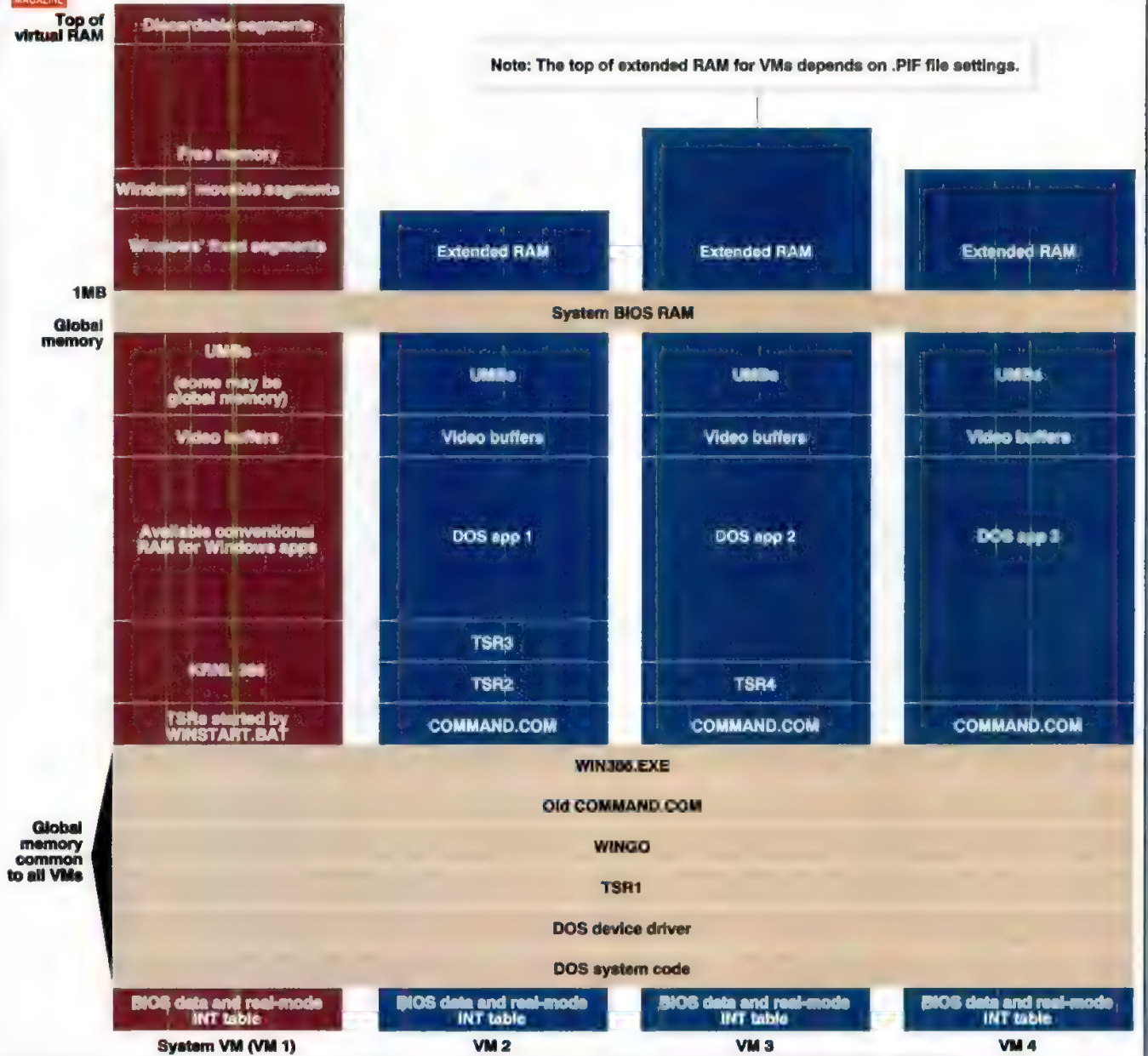


Figure 4: In this diagram, Enhanced-mode Windows and several DOS sessions (or virtual machines) are running simultaneously. Since all Windows programs run in the protected mode of the system VM, DOS programs have to find a way to access the system VM before they can actually communicate with a Windows program.

ruary 12, 1991, issue of *PC Magazine*.)

WINGO and WINSTART use only a few of the many DPMI functions. To tell WINSTART that it needs to start a Windows program, WINGO uses a DPMI function called a *real-mode callback*. All WINGO has to do is make a far call to an address; the DPMI will intercept the call, switch to protected mode, and call the appropri-

ate routine in WINSTART. While the actual call is deceptively simple, the setup for the call is not.

Before WINGO can make a far call to WINSTART, it must have an address to call. Since only WINSTART can provide the address of the routine, it must call WINGO to give it the address of the routine—but WINSTART doesn't have

an address for WINGO! To solve this problem, WINSTART uses the Multiplex interrupt for communication.

While it might seem that all WINSTART needs to do is call INT 2Fh, that won't work in this case. Since WINSTART is running in protected mode, the interrupt vector table that points to the interrupt routines is different than the real-

ENHANCED-MODE WINDOWS DOS API

All calls made to Multiplex interrupt (2Fh) or received by hooking into the Multiplex interrupt.

Enhanced mode Windows Install Check

Determines if Enhanced mode Windows is running

Entry: AX = 1600h

Exit: AX = If Windows 3.0 or greater running,
 AL = Major Windows Version
 AH = Minor Windows Version
 01h - Enhanced mode Windows is running
 FFh - Enhanced mode Windows is running
 80h - Enhanced mode Windows is not running

Windows Launch Broadcast

Call made by Windows when launched at the DOS prompt

Entry: AX = 1605h

ES:BX = Ptr to last instance memory structure
 CX = 0
 DX = Bit 0 set indicates standard mode start otherwise
 Enhanced Windows start.
 DI = Windows version. Major version in lower byte

Exit: ES:BX = Points to new instance memory structure if needed
 CX = non zero aborts Windows launch
 DS:SI = Ptr to real mode enable/disable routine (used
 by DOS extenders.)

Windows Exit Broadcast

Call made by Windows when launched at the DOS prompt

Entry: AX = 1606h

DX = Bit 0 set indicates standard mode exit otherwise
 Enhanced Windows exit.

Windows Launch Complete Broadcast

Call made by Windows when Windows launched complete

Entry: AX = 1608h

Windows Exit Start Broadcast

Call made by Windows when begins exit procedure

Entry: AX = 1609h

Release VM timeslice

Call made by DOS programs to release remainder of timeslice. This call also works with OS/2. DOS programs should call this function when waiting idle to improve system performance.

Entry: AX = 1600h

Begin Critical Section

Call made by DOS programs to prevent Windows from switching away from the current VM. This call should be used sparingly since it reduces system performance.

Entry: AX = 1601h

End Critical Section

Call made by DOS programs to end the critical section started by calling 1601h.

Entry: AX = 1602h

Get current VM

Call made by DOS programs to determine the current virtual machine.

Entry: AX = 1603h

Exit: BX = VM ID

Get VxD device DOS API entry point

Call made by DOS programs to get the DOS API entry point for a Windows virtual device driver (VxD). Only a few VxDs have DOS mode entry points.

Entry: AX = 1604h
 BX = VxD ID number
 ES:DI = 0

Exit: ES:DI = 0:0 if no entry point. Otherwise points to entry point.

Switch VM and Call back

Call made by DOS programs to switch to another VM and execute a subroutine in that VM. The routine in the other VM executes asynchronously from the call.

Entry: AX = 1605h
 BX = VM to switch to
 CX = Flags,
 bit 0 = 1, Wait until interrupts enabled
 bit 1 = 1, Wait until no critical section
 DX,SI = Priority boost for switched VM
 ES:DI = Pointer to routine to call



Figure 5: You can use this API to access some Windows features from a DOS program via the Multiplex interrupt with device ID 16h. The documentation for this API is in the Windows DDK.

mode interrupt vector table. Therefore, an INT 2F in protected mode would jump to the protected-mode INT 2F handler, not to WINGO.

DPMI comes to the rescue with a method that a protected-mode program can use to create a real-mode interrupt. The DPMI call, conveniently called Simulate Real Mode Interrupt, gives protected-mode programs the ability to simulate any of the 256 real-mode interrupts. WINSTART uses this call to simulate the real-mode Multiplex interrupt that WINGO sees.

WINSTART uses the Multiplex interrupt the same way that the transient part of WINGO uses it to determine if WINGO is installed. WINSTART places a device ID in AH, clears AL, and performs a Multiplex interrupt. The only difference is that WINSTART must use a DPMI function to simulate an interrupt in real mode. Just as the transient WINGO code searches through all the available device IDs, so does WINSTART. If WINSTART

cannot find WINGO, it displays a message box and terminates.

Once it finds the installed WINGO code, WINSTART performs another real-mode Multiplex interrupt, this time with AL = 1 and the far address of the routine, to call in WINSTART loaded in DX:DX. WINGO then saves the address for use by the routine Main when it calls WINSTART. WINSTART uses the Multiplex interrupt for other WINGO communication, notably to pass its enable/disable status.

The address passed to WINGO is not the exact address of the routine in WINSTART. It couldn't be, since the WINSTART procedure address is a selector:offset address that has no meaning to the real-mode segment:offset world of WINGO. This major problem is again solved by a DPMI function: in this case, Allocate Real Mode Callback. WINSTART passes the protected-mode selector:offset address of the callback procedure to

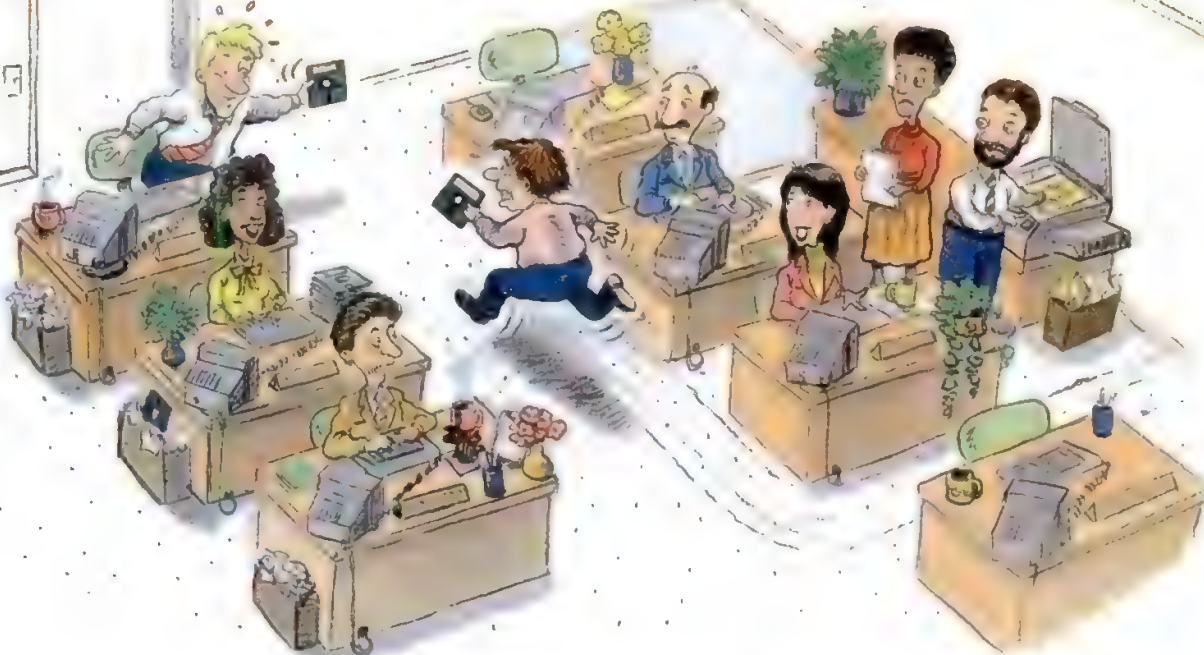
DPMI, which returns a real-mode segment:offset address for WINGO to call.

To review, we now have established methods for WINGO and WINSTART communication. WINGO talks to WINSTART using a real-mode callback. WINSTART talks back to WINGO using the Simulate Real Mode Interrupt function. The only remaining problem is passing the name of the Windows program to start and its command line parameters from WINGO to WINSTART.

When WINGO calls WINSTART (using the real-mode callback), it passes a pointer to a buffer that contains the name of the Windows program to start. Unfortunately, we have another conflict between real mode and protected mode: WINGO passes a real-mode segment:offset address, but WINSTART needs a protected-mode selector:offset address. Again, DPMI comes through with a few undocumented Windows functions.

DPMI has functions for creating cus-

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As with all good software, the programs presented in *PC Magazine* are periodically upgraded and improved. You can get the modified versions by downloading them from PC MagNet. Here's a partial list of the programs that have been upgraded to fix minor bugs and system incompatibilities. If the filename listed here is longer than six letters, search on the first six letters, using the same extension.

- ANSI.COM, Version 1.3
- BAT2EXEC.COM, Version 1.5
- BCOPY, Version 1.2
- Benchmark Series, Version 6.0a (BEN60A.EXE)
- CARDFILE.COM, Version 1.1
- CHKFRAG.EXE, Version 1.5
- CMDEDIT.EXE, Version 2.01
- CONFIG.CTL, Version 3.0
- DIRMATCH.COM, Version 3.1
- EMMA.COM, Version 2.2
- EMS40.SYS, Version 1.1

- PANDORA.COM, Version 2.4
- PCACCESS.EXE, Version 1.1
- PCMANAGE.EXE, Version 1.1
- RN.COM, Version 3.0
- SCHEDULE.COM, Version 1.1
- SLICE.COM, Version 1.3
- SNIPPER.COM, Version 1.2
- TPFST-AT.COM, Version 1.1
- ZCOPY.COM, Version 1.4

For a complete list of all the programs available from the PC MagNet Software and Utilities Database Library, download PCMCAT.ZIP.

A downloadable index to *PC Magazine's* product reviews is also available. PCM.EXE is a self-extracting file that contains the *Computer Library PC Magazine Reviews Index* for January 1988 to June 1991. It requires the search files in PCSRCH.EXE. Please read the information file PCM.INF before you download any of these files. ■

tom protected-mode selectors. Normally, when a protected-mode program allocates memory, it doesn't care where that memory is physically located; this is one of the features of protected mode. In some cases, however, a protected-mode program such as WINSTART needs a selector to point to a specific region of memory. Windows provides three functions (undocumented in Windows 3.0)—AllocSelector, SetSelectorBase, and SetSelectorLimit—to define exactly where the selector points in physical memory. While the Windows selector functions simply call equivalent DPMI functions, calling Windows functions is easier than calling the lower-level DPMI functions.

When WINSTART receives the pointer to the name of the Windows program, it uses the offset from the pointer combined with a protected-mode selector that maps to the real-mode segment passed with the pointer. This allows WINSTART to copy the name of the Windows program into the WINSTART local memory heap. It would seem that WINSTART could then simply call WinExec from the callback procedure to start the Windows program. Unfortunately, our work isn't quite done.

When the callback procedure is called, Windows is in an unknown and possibly unstable state, and only a few of the hundreds of Windows functions can be called. Fortunately, one of the functions that can be called is PostMessage. To resynchronize with Windows, the callback procedure posts a message to the WINSTART window procedure, WinProc. The callback procedure then returns to WINGO using an IRET.

When WinProc receives the message the callback procedure sent, Windows is again resynchronized so all the Windows API functions are available. We can now complete the final task by calling WinExec to start the requested Windows program. The new program starts, and Windows switches its focus to the new program.

DPMI functions are called by placing a command number on AX and performing (protected-mode) INT 31h. Since it isn't convenient to force interrupts and deal with register parameters from C, WINSTART uses routines written in assembly language to call the DPMI functions. The assembly language routines are written using the embedded assembly lan-

guage feature of Microsoft C 6.0, but they could be easily removed from the C source and placed in a separate assembly language file.

The callback routine that WINGO calls—CallbackProc—also uses in-line assembly language for a similar reason. Although CallbackProc doesn't make any DPMI calls, the routine needs to know what the contents of the registers were when WINGO called the callback procedure. When WINGO calls the callback address, DPMI saves the contents of all the registers in a register structure. When the callback routine in WINSTART is subsequently called, a pointer to this register structure is passed by DPMI in ES:DI.

The register structure contains fields for all registers including CS and IP. Before the callback procedure can return to WINGO, the correct CS and IP must be removed from the register structure and placed on the real-mode stack. DPMI passes a pointer to the real-mode stack in DS:SI when the callback procedure is called. This allows the callback routine complete control of where DPMI returns to the real-mode code, but also imposes the burden of setting the return address on the callback routine.

A final note on WINSTART: Since WINSTART never restores from an icon, the menu items are placed in the icon's System menu. WINSTART uses the GetSystemMenu, AppendMenu, and DeleteMenu calls to change the icon system menu to suit WINSTART.

If you are interested in obtaining more information about the convoluted process of DOS-to-Windows communication, DPMI, or the Windows Multiplex interrupt API, I suggest the following sources in addition to the ones mentioned earlier in this column: *The MS-DOS Programming Reference* (Microsoft Press, 1991); *The DPMI 1.0 Specification*, available from Intel (order number 240977-001); *Extending DOS* (Addison-Wesley Publishing, 1990), edited by Ray Duncan; and the Windows Device Development Kit, available from Microsoft.

Using WINGO and WINSTART, however, doesn't require volumes of research. In fact, you should be reading less than you presently do: You won't have to read that infamous message "This program requires Microsoft Windows" anymore! ■

Douglas Boling is a contributing editor to PC Magazine.

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by
Jay Munro

Lab Notes

Part 1 of this Lab Notes column covered the process of writing a DLL (dynamic link library) in assembler for Windows to use with Visual Basic, Version 1.0. Now it's time to look inside LABNOTES.DLL and see how it supplies some of Quick-Basic's low-level functions that were omitted from Visual Basic itself.

USING THE DLL

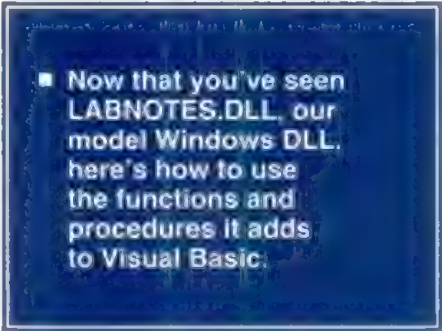
Visual Basic supports two types of external procedures: subroutines and functions. A *subroutine* is a procedure or self-contained piece of code that does not directly return a value to the calling program. A *function* is a procedure that can return a value directly. It can also be used to assign a value to a variable or be used as a variable itself. Both subroutines and functions can modify parameters that are passed to them.

External DLL subroutines and functions must be declared in the Visual Basic program if they are to be called. A *declaration* is simply a Visual Basic template that sets the type and order of the variables and contains the name of the library that has the function. When the routine does not return a value, it is declared as a sub; when it does return a value, it is declared as a function. Function declarations must also specify the type of return value, such as string, integer, and so forth.

Applications written in Visual Basic are done in what is called a project format. The *project* is a collection of modules, which may contain declarations, forms with visual information, or code modules. Every Visual Basic project has at least one main form module and one Global module. Declarations may be placed either in the Global module or in the general declaration area of any of the other modules. You must decide in which module you want to declare your procedures, based on the scope (that is, the degree of accessibility) you want your routines to have.

The scope of a declared routine deter-

Writing DLLs for Windows Using Visual Basic, Part 2



■ Now that you've seen LABNOTES.DLL, our model Windows DLL, here's how to use the functions and procedures it adds to Visual Basic.

mines which modules may use the routine. Routines declared in the Global module have the widest scope, since they may be called from any module connected with the project. When required by your program, the scope of a routine can be limited simply by declaring it in the General Declaration area of the module that will actually access it.

The syntax for declaring subroutines and functions is similar in form and is illustrated in Figure 1(a). Here, the library field, `Lib "libname"`, determines where Visual Basic can find the DLL in order to load it. For Windows API functions, the "libname" can simply be "USER," "KERNEL," "GDI," or one of the many other DLLs that make up the API. If no path is specified, Windows will look first in the project directory and then in the Windows System directory. If your DLL resides in another directory, you must specify the full path to avoid a "File Not Found" error.

The arguments passed to a DLL routine must be declared to be by either reference or value. The arguments are passed from the Visual Basic program to the

DLL function by being put on the stack. In a DLL, the stack is a common memory area shared by both the calling program and the library function.

The difference between declaring by value and by reference lies in what information is put on the stack. The default method of passing a variable is by reference; you use the keyword `ByVal` to pass by value. When Visual Basic passes arguments by reference, what it passes is the *address* of the variable. Thus, if a program has a variable `X%` that contains a value of 5, the address at which the value is stored is what is passed by reference. All addresses passed by Visual Basic are 4-byte long pointers, using both the segment and offset of the address. A function that receives a value by reference must retrieve the actual value from that address location before use. Any modifications made to the value at that address are also seen by the calling program.

An argument declared `ByVal` passes the actual *value* rather than the address of the parameter. In the example just cited, the integer value 5 would be put on the stack for the function to retrieve. Any changes or modifications made to a parameter passed by value will not be reflected in the calling program. To specify that a variable is to be passed by value, the `ByVal` keyword is used, as shown in the sample code in Figure 1(b). A routine expecting an argument passed by value will not work correctly when passed an argument by reference.

Most Windows API subs and functions expect variables to be passed by value. API functions documented in the

SDK and other publications are specified in C language format, in which the default argument passing syntax is by value. In Visual Basic, however, when a function specifies a long-pointer argument, the parameter is passed by reference.

API functions that require a string argument expect a long pointer to an ASCIIZ string. (An ASCIIZ string is a string of characters terminated with a 0.) Normally, a Visual Basic string is passed as an HLStr—that is, as a handle to a language string. But to accommodate functions that require ASCIIZ strings, Visual Basic uses the ByVal keyword to specify the ASCIIZ string as an argument. Unlike the use of ByVal on a numeric variable, then, Visual Basic creates a long pointer to an ASCIIZ string and passes that. In this case, Visual Basic passes just the address; it does not pass the whole string on the stack. This is explained in more detail in the sidebar “Strings in Visual Basic.”

CONTROL NAMES AS ARGUMENTS

Visual Basic controls are specialized windows that provide for on-screen interaction between the user and the program. Visual Basic contains 15 standard controls for displaying pictures, listing files and directories, prompting for and receiving input, and for other user interface functions. The properties and characteristics of the controls can be accessed from the Visual Basic environment or from the program itself. Visual Basic controls are based on standard Windows controls and are created through a process called subclassing.

The type or genre of procedure that Windows recognizes as a Control Class can cover a broad spectrum of functionality. For example, the Button class encompasses the push button, radio button, caps-on button, check box, and several other types of buttons. When Visual Basic subclasses a control, it creates a structure

in memory that contains information about what the control is and does. Once subclassed, the control has two handles, hWnd and hCtl, which are used subsequently to identify and access the properties.

The hWnd is the handle to the window. This is used by many API procedures that exercise or modify the window's functionality. For example, a list box full of strings can be cleared with one API call if you have the hWnd list control. The problem is that Visual Basic does not make available an hWnd for its controls. What, then, about the second handle, hCtl (Handle to Control)?

Internally, Visual Basic uses an hCtl to identify the control. The hCtl is really a pointer to the memory structure that contains information about the control. Other than for a few internal Visual Basic API functions, the hCtl would not be very useful except that it can be used with the VBAPI function VBGetControlhWnd to return the hWnd.

In LABNOTES.DLL, the ControlhWnd function accepts an hCtl as an argument, calls VBGetControlhWnd, and returns the control's hWnd. Conveniently, Visual Basic passes the hCtl to a function when you use the control's name as an argument. Here's the syntax for declaring and calling the ControlhWnd function:

```
'-- -Declare function Declare
Function ControlhWnd% Lib
  "Labnotes.DLL" (hCtl as Control)
'-- -Use function ListhWnd% =
ControlhWnd%(List1)
```

Visual Basic control properties that show up in the Property bar in the development environment are usually provided by the Windows parent class of the control. In many cases the parent class provides more properties or functions than

are made available by Visual Basic. By obtaining the hWnd to the List control, however, your program can use properties that are part of the parent class but that are unused by Visual Basic itself.

THE LABNOTES.DLL ROUTINES

LABNOTES.DLL is a collection of assembly language routines that put some of QuickBasic's low-level functions back into Visual Basic. A list of these files, which can be downloaded from PC MagNet, is shown in Figure 2. Inspecting the source-code files is the best way to learn how the routines actually work. Each file has the declaration, calling syntax, and a short description of how it works. The entire LABNOTES.DLL can be assembled using MASM 5.1 or 6.0, and it can be linked without the use of the SDK.

Although the LABNOTES.DLL routines will give you functionality not currently supported in Visual Basic, they may not work in every situation. Windows is a complex environment and is given to unpredictable behavior when a program doesn't play by the rules. The rules—such as not trying to access memory another program is using—are pretty straightforward, but I'll try to point out less obvious situations that might cause trouble when using a routine.

REALLY LOW-LEVEL ROUTINES

Visual Basic supports seven variable types, which gives you the ability to manipulate values in many different ways. Occasionally, however, your program may need the address of a variable rather than its actual value. Internally, Visual Basic maintains the long addresses to variables but does not provide them to the programmer. The next five functions, whose declaration syntax is shown in Figure 3(a), provide segment selectors, addresses, or both for use with other low-level functions in LABNOTES.DLL.

For numeric variables and types, the segment and offset may be obtained with the VarSeg% and VarPtr% functions. In the declaration, I've specified the Arg parameter as Any, which directs Visual Basic to accept any type of variable and pass just its address. The VarSeg and VarPtr return the segment or offset portion of that address, respectively. The third routine, SegAdr&, returns the whole address as a long integer.

The SSeg% and Saddr% functions accept a conventional variable-length

MYLIB.DLL

PARTIAL LISTING

```
(a)
'--- Subroutine declaration (in Global module) Declare Sub MyRoutine Lib
"MYLIB.DLL" (Parm1%, Parm2%)
'--- Subroutine syntax as used in your program Call MyRoutine(X%, A%)
'--- Function declaration (in Global module) Declare Function MyFunction% Lib
"MYLIB.DLL" (Parm1%, Parm2%)
'--- Function syntax as used in your program Y% = MyFunction%(X%, A%)

(b)
Declare Sub MySub Lib "MyDLL.DLL" (Byval A%, Byval B%)
```

Figure 1: The lines in (a) illustrate the syntax for subroutine and function declarations; the keyword ByVal in (b) is used to pass variables by value rather than by reference.

STRINGS IN VISUAL BASIC

by Jay Munro

String handling is a fundamental task in any language, and Visual Basic provides API (application program interface) functions that make using strings easier for low-level programmers. Visual Basic not only provides complete string management, it also facilitates proper use by DLLs (dynamic link libraries) and supplies API functions for using and creating Visual Basic Language strings.

When interfacing with external DLL routines, Visual Basic's native string type is the HLStr, or handle to a language string. An HLStr is a 4-byte argument that is used whenever a non-ByVal (non-ASCIIZ) string is passed to a routine. When a function needs to use a string, its length and address must be obtained.

When a function receives the HLStr,

the 4 bytes are passed to two VBAPI functions. These return the length (VBGetHLStrLen) and address (VBDeRefHLStr) VBGetHLStrLen is analogous to BASIC's LEN function. The HLStr is passed to the function, and the length is returned in AX. VBDeRefHLStr corresponds to the BASIC sadd, or String Address function. Like the length function, the HLStr is passed, and VBDeRefHLStr returns a long pointer to the string, in registers DX:AX.

One interesting point to note is that the HLStr is not zero-terminated. But strings created by Visual Basic do allocate one or two extra bytes on the end, depending on whether the string is of odd or even length. When Visual Basic is asked to pass an ASCIIZ (zero-terminated) string, it simply puts a 0 in the extra byte. In such a case, Visual Basic

passes the address of the string data rather than the HLStr.

The code fragment shown in Figure A shows how an assembler routine can get the length and address of an incoming HLStr string. Notice that the HLStr is retrieved directly into DS:SI by the instruction `Lds SI, [BP+6]`. This can be done because the high word of the HLStr is actually a selector, which is legal to load into DS under protected mode. Loading DS:SI with the HLStr guarantees that the HLStr will be preserved through the call to VBGetHLStrLen, since Visual Basic preserves DS, SI, and DI for external routines.

For the call to VBDeRefHLStr, you must push AX (the length, which will later be retrieved into CX) or you'll lose that value after the call. The HLStr (DS:SI) is again pushed as an argument to VBDeRefHLStr. VBDeRefHLStr dereferences (returns the address of) the incoming string in DX:AX. The address can then be moved into more convenient registers for use by the rest of the program. In Visual Basic, Version 1.0, an undocumented feature of VBDeRefHLStr is that it also returns the length of the string in CX. It is up to the programmer whether to bother using VBGetHLStrLen or not, but for future compatibility it is recommended.

The other side of string handling is string creation. For a function to return a string value to Visual Basic, a compatible string must be created. The VBAPI function VBCreateHLStr takes a long pointer to the string data (LPStr), together with the length of a string, as its arguments. It then allocates a string in Visual Basic's string pool. VBCreateHLStr then returns an HLStr in DX:AX so that your function can return to the calling program. The string data can be created by your DLL function on the stack, in DGroup, or even as a constant value in the Code segment, as long as you can pass a length and a long pointer to VBCreateHLStr. The MKI routine shown in Figure B pro-

TESTSTRING

PARTIAL LISTING

```
TestString Proc Far
    WinProlog                ;windows prolog macro code
    Push SI                  ;save SI for VB

    Lds SI, [BP+6]           ;the string is the only parameter
    Push DS                  ;HLStr is in DS:SI
    Push SI                  ;push the HLStr as argument to VBGetHLStrLen
    Call VBGetHLStrLen       ;length returned in AX
    Push AX                  ;save length from being trashed
    Push DS                  ;push HLStr again as argument to
    Push SI                  ; VBDeRefHLStr
    Call VBDeRefHLStr        ;address returned in DX:AX
    Pop CX                   ;retrieve length into CX for use
    Mov DS,DX                ;assign address of string
    Mov SI,AX                ; to DS:SI for our program....
    ....
```

Figure A: Using code similar to this, an assembly language routine can obtain the length and address of an HLStr string.

MKI PROCEDURE

PARTIAL LISTING

```
MKI Proc Far
    WinProlog                ;windows prolog macro code
    Lea AX, [BP+6]           ;load address of the incoming integer into AX
    Push SS                  ;integer is on stack (source selector)
    Push AX                  ;address of integer
    Push 2                   ;length of string (integer = 2 bytes)
    Call VBCreateHLStr       ;create a string in VB
    WinEpilog                ;windows epilog macro code
    Ret 2                    ;return with DX:AX loaded with HLStr

MKI EndP
End
```

Figure B: A DLL can create string data on the stack (as shown) in DGroup, or even as a constant value in the Code segment.

CONTINUES

STRINGS IN VISUAL BASIC

CONTINUED

vides an example of using the stack as a source for the string.

In the MKI function, the incoming

integer argument is passed by value, so the value on the stack is at [BP+6]. The `Lea` instruction puts the effective address into `AX`, which is then passed

to `VBCreateHLStr`. The length of an integer is 2 bytes, so a 2 is passed as the length and a call is made to `VBCreateHLStr`. The stack segment, `SS`, is also passed because that is where the integer value was stored.

If your function had a value that it created in `DGroup`, then the syntax would be slightly different, as shown in the fragment listed in Figure C. Although the source is different, the concept is the same. The string is stored in `DGroup` (`DS`), and the address and length are passed as arguments to `VBCreateHLStr`.

Because `DGroup` and the Stack segment are limited to 64K and 16K, respectively, string constants can alternatively be stored in the Code segment, should this be necessary for reasons of space. The Windows protected-mode environment allows your program to read its own code segment, so you can have many string constants stored in `CS`, transferring them to the string segment only as needed. You can use this technique to create standard prompts, error messages, and look-up tables. Figure D returns a classic line to Visual Basic.

When you use Visual Basic to write external routines, the address of the string should not be preserved between calls to the routine. Since Visual Basic maintains its string space dynamically, there is always a possibility that the string's address may change. You can rely on the dereferenced string address to be constant for the duration of a call, but not after leaving the called function. Thus, subsequent calls will require that the `HLStr` be dereferenced each time.

GETMYDATA PROCEDURE

PARTIAL LISTING

```
.Data
MyData      DB  'pass me back' ;string to pass
MyDataLen   DW  $-MyData      ;figure length of Mydata

.Code
GetMyData Proc Far
WinProlog           ;required windows prolog...
Mov  AX,Offset MyData ;get address of Mydata (in DGroup)
Push DS             ;push segment
Push AX             ;and address
Push MyDataLen      ;push length of string in DGroup
Call VBCreateHLStr  ; create the string...
```

Figure C: In this code fragment, the string data is created in `DGroup`.

CODE SEGMENT PROCEDURE

PARTIAL LISTING

```
;using the code segment as source on a string function
.286p
.Model Medium
Include Labnotes.inc ;macros
Extrn VBCreateHLStr:Proc
.Code

;---Message in code segment
ErrorMsg DB 'Will I dream Dave ? ' ;message to print
MsgLen   DW $-ErrorMsg             ;length of message

Halspeaks Proc Far
WinProlog           ;prolog
;---Assign function
Push CS             ;push code segment
Lea  AX,ErrorMsg    ;get address of message
Push AX             ;push it
Push CS:MsgLen      ;push length of message
Call VBCreateHLStr  ;create string
WinEpiLog           ;epilog macro
Ret                 ;return- DX:AX contains HLStr for message

Halspeaks EndP
End
```

Figure D: There is one more alternative; the code segment can be used as the source for string data.

string argument and return the segment selector and offset of the string data. The same result can also be obtained by using `VarSeg` and `VarPtr`, using the declarations listed in Figure 3(b).

PEEK, POKE, INP, AND OUT

Peek and Poke are memory access routines that go back to the earliest versions of BASIC. Under a protected-mode envi-

ronment such as Windows, your program has read and write privileges only to certain areas of memory, however, and care must be taken not to access memory outside that area.

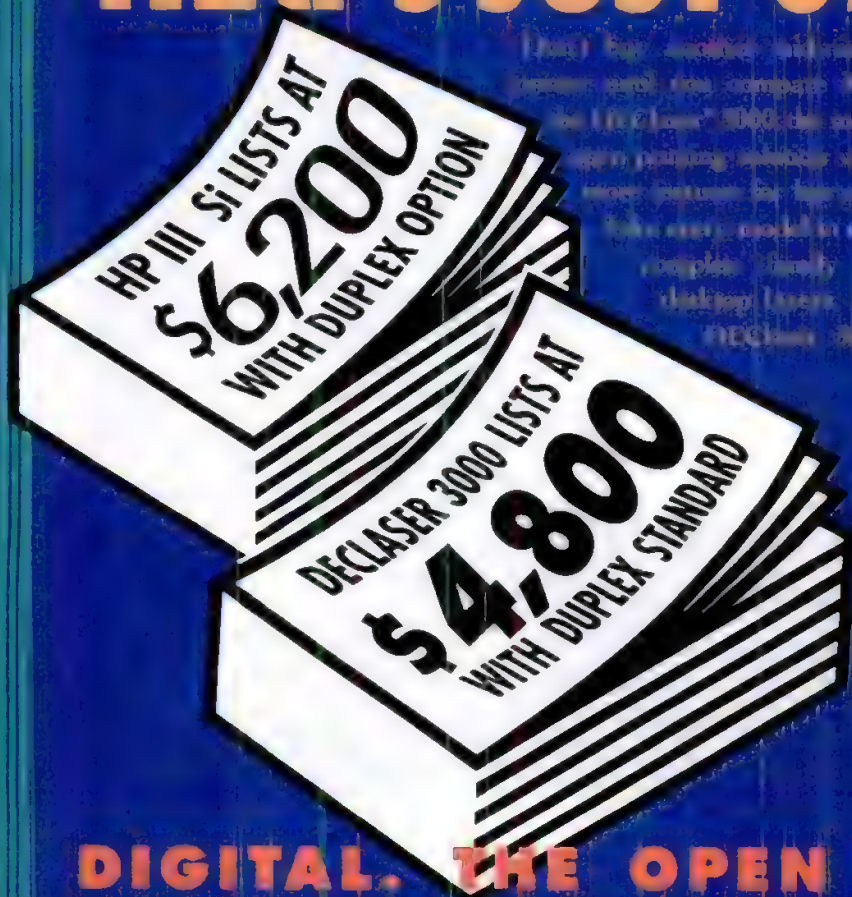
The Peek and Poke routines both use the protected-mode instruction `verx` to avoid problems. Peek uses `verr` for VERIFY Read, and Poke uses `verw` for VERIFY Write. Both routines will return without

accessing memory if the segments do not check out. Peek is an integer function and, as in QuickBasic, retrieves only 1 byte (the low byte) from memory. Unlike QuickBasic, Peek and Poke require the segment (selector) as well as the offset of the byte to read or the memory location to which to write. QuickBasic uses the `DEF SEG` statement to set the current default segment. Peek or Poke will then access

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an offset in that segment. The necessary declarations are shown in Figure 3(c). Once declared, the Peek and Poke routines may be used in much the same way as their QuickBasic cousins, as shown in Figure 3(d).

One problem Visual Basic users will encounter when using Peek and Poke is that many operations—such as accessing low memory for equipment lists and monitor types—can't be done directly from protected mode. Trying to Peek location 0000:0463h directly creates a protection violation, which in Windows results in a UAE (Unrecoverable Application Error). Fortunately, Windows has provided for this need by exporting constant values, known as *absolute (ABS) selectors*, for common memory segments. These underdocumented selectors are exported from the KERNEL DLL and are declared in assembler as ABS externals.

I've gathered up all the ABS selectors into one routine, called GetABS. The GetABS function takes a segment as an argument, compares it with the list of available ABS selectors, and returns the appropriate one if there is a match. The segments that may be used are 0000h, 0040h, A000h, B000h, B800h, C000h, D000h, E000h, and F000h. This segment list pretty much covers lower memory, monochrome and color video, and EMS page-memory locations. If the segment is not found, a -1 or 0FFFFh is returned to indicate an error.

The syntax for GetABS is shown in Figure 3(e), and the code fragment in Figure 3(f) illustrates a technique for determining the primary monitor type on a system using GetABS and Peek from LABNOTES.DLL. The segment value &h0000

is passed to the GetABS routine, and LoMem% receives the selector. The selector is used with Peek to get a byte and check its value to see the monitor type. The routines discussed in the debugging section at the end of this article use the same ABS selector technique to print characters to a second monitor (a monochrome is all you need).

Inp and Out are also low-level routines that are not part of the native Visual Basic language. Since they perform input and output services to the CPU's ports, they are not under restrictions as tight as those applying to memory routines. This does not mean that you have a free hand in accessing just any port under Windows, as you do under DOS, however. You must take some care in the communications ports area because Windows can remap them if need be. Similarly, you should approach accessing the timer port very gingerly.

When using Inp and Out on a multi-tasking system, you must remember that what you do to the hardware from one program may affect the performance of other programs that are running. Industrial data-acquisition systems have traditionally made heavy use of the CPU ports for passing data between machinery and the computer. Unless the application is very time-critical, the Inp and Out routines can easily be used for such programming. The time it takes Visual Basic to call the Inp or Out routine must be considered, as must the initial loading time for the DLL. If a program must access a port with a large amount of data in a short amount of time, it is best to write a dedicated DLL routine to do it. The syntax for the Inp and Out routines is shown in Figure 3(g).

ADDING CVX AND MKXS

The BASIC functions CVx\$ and MKx\$ were originally intended for use with Field statements and random file access. Since Visual Basic doesn't support Field statements and it uses type variables for random access, its omission of these instructions seems easy to justify. But a Visual Basic programmer who needs all the power of the Windows API may find them useful for converting data stored in buffers to numeric information and then back again.

Suppose, for example, that your program needs to read several different data file formats, each of which has a header that contains numeric and string data. Since you may not be able to determine the file

LABNOTES.DLL FILES AND DESCRIPTIONS	
Assembly language source files	
LIBENTRY.ASM	— The entry module Windows calls when LABNOTES.DLL is loaded.
LIBMAIN.ASM	— The initialization module for LABNOTES.DLL.
VBAPI.ASM	— The Visual Basic API internal routine module, which resolves calls to VBAPI functions used in LABNOTES.DLL.
PCMARK.ASM	— The source code for a Windows 3.x .EXE header-marking utility.
LABSTUB.ASM	— The stub module that displays a message if a DLL is run from DOS.
CTRLHWND.ASM	— A function that returns an hWnd of a Control.
GETABS.ASM	— A function that returns selectors for a group of exported hardware memory addresses.
INTRPT.ASM	— A function to access DOS interrupts from Visual Basic.
MK_CV.ASM	— The module containing MKI, MKL, MKS, MKD, MKC, CVI, CVL, CVS, CVD, and CVC data-conversion functions.
MONOPRNT.ASM	— A subroutine to print text to a second (monochrome) monitor from a Visual Basic program.
OUTINP.ASM	— The module containing OUT and INP port access functions.
PEEKPOKE.ASM	— The module containing Peek and Poke memory access functions.
REGPRINT.ASM	— A debugging subroutine (not exported) to print the current register status from within a DLL function.
VARSEG.ASM	— The module containing VARSEG, VARPTR, SSEG, SADD, and SEG variable address functions.
Support modules	
LABNOTES.BAT	— A batch file to build LABNOTES.DLL.
LABNOTES.DEF	— The definition file for LABNOTES.DLL.
LABNOTES.INC	— The include file for macros used in functions.
LABNOTES.LNK	— The link response file for LABNOTES.DLL.
LABSTUB.EXE	— The executable stub file for LABNOTES.DLL.
PCMARK.EXE	— A Windows 3.x .EXE header-marking utility.
Demos	
DEMOLL.MAK	— The Visual Basic Make file for a demo of LABNOTES.DLL.
DEMOLL.FRM	— The Visual Basic Form file source.
GLOBAL.BAS	— The Global Declaration file for a demo.

Figure 2: You can download all of the files for LABNOTES.DLL from PC MagNet. The .ASM files can be assembled with MASM 5.1 or 6.0 and do not require the Windows Software Development Kit (SDK) for linking.



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structure ahead of time, you can't write a type structure. If you load the structure into a string, however, it can be parsed with `Mid$()`, and the numeric strings can be converted to their appropriate variable types with `CVx`. The *x* in `CVx` is a place holder for one of Visual Basic's five variable types: integer, long, single, double, and currency. To reverse the process—that is, to put a numeric variable into a string form to be put back into the buffer with `Mid$`—you use `MKx$`. The *x* is a place holder for the variable type. The full list of `CV` and `MK` functions is shown in Figure 3(h).

Note that the numeric variables in the DLL's `MKx` functions are passed by value. If the variables are passed by reference (that is, without the `ByVal` keyword), while they will not crash, they will return strings of bad data.

CALL INTERRUPT

For many QuickBasic programmers one of their first external add-on routines is the interrupt function, since it provides a door from the BASIC environment to the inner workings of DOS. DOS provides a wide range of low-level functions that programmers can access through the use of interrupts. Interrupts are the subroutines and functions of DOS, and instead of passing variables, the CPU's registers are used. The most common, `INT 21h`, lets you take control of file access, version checking, and a multitude of other DOS services. Other interrupts provide video (10h), comm port (14h), printer (17h), and even network support. Naturally, Windows itself also provides many services through API functions, and these

should be used whenever possible. However, it is still sometimes necessary to go right to DOS with an interrupt call.

The interrupt function in the `LABNOTES.DLL` library is a generic BASIC call interrupt routine. To load the CPU's registers, a BASIC-type structure is loaded with the values to be passed. The registers `AX`, `BX`, `CX`, `DX`, `SI`, `DI`, `BP`, `DS`, `ES`, and the Flag register are accessible with the type. The type definition, `Regs`, is put in the Global module, and variables are dimensioned as `Regs`. The interrupt function is declared and used in the example listed in Figure 3(i).

This example defines the type variable and makes the declaration of interrupt in the Global module. The variable `MyRegs` is dimensioned as `Regs` in the module-level code. The `AX` register is loaded with `&h3000`, which puts 30h—the

LABNOTES.DLL	PARTIAL LISTING
<pre> (a) Declare Function VarSeg Lib "Labnotes.DLL" (Arg as Any) Declare Function VarPtr Lib "Labnotes.DLL" (Arg as Any) Declare Function SegAddr Lib "Labnotes.DLL" (Arg as Any) Declare Function SSeg Lib "Labnotes.DLL" (Arg as String) Declare Function SAddr Lib "Labnotes.DLL" (Arg as String) (b) Declare Function VarSeg Lib "Labnotes.DLL" (ByVal Arg as String) Declare Function VarPtr Lib "Labnotes.DLL" (ByVal Arg as String) (c) Declare Function Peek Lib "Labnotes.DLL" (ByVal Segment, ByVal Offset) Declare Sub Poke Lib "Labnotes.DLL" (ByVal Segment, ByVal Address, ByVal ByteData) (d) ByteOfData = Peek(Segment, Address) 'Get a byte Poke Segment, Address, DataByte 'Put a byte (e) Declare Function GetAbs Lib "LabNotes.DLL" (ByVal Segment) (f) '-- Check for mono monitor LoMem = GetAbs(&h0000) 'selector for segment zero If LoMem <> -1 Then 'Check in case of error If Peek(LoMem, &h463) = &h84 then 'If the byte = &h84 then Print "Monochrome" 'we have a mono monitor Else 'any other value Print "Color" 'means color End If Else Print "LoMem was not a valid address" 'Error in GetAbs argument End If (g) '--- declarations in global Declare Function Inp Lib "Labnotes.DLL" (ByVal Port) Declare Sub Out Lib "Labnotes.DLL" (ByVal Port, ByVal DataArg) '--- check for math coprocessor via CMOS Ram Port = 112 : DByte = &h14 Out Port, DByte 'set up port index Port = Port + 1 'read data on CMOS If Inp(Port) AND 2 then Print "Coprocessor installed" Else Print "Coprocessor not installed" End If (h) Declare Function CVI Lib "Labnotes.DLL" (Numeric) Declare Function CVS Lib "Labnotes.DLL" (Numeric) Declare Function CVD Lib "Labnotes.DLL" (Numeric) </pre>	<pre> Declare Function CUL Lib "Labnotes.DLL" (Numeric) Declare Function CVC Lib "Labnotes.DLL" (Numeric) Declare Function MKI Lib "Labnotes.DLL" (ByVal I) Declare Function MKS Lib "Labnotes.DLL" (ByVal S) Declare Function MKD Lib "Labnotes.DLL" (ByVal D) Declare Function MKL Lib "Labnotes.DLL" (ByVal L) Declare Function MKC Lib "Labnotes.DLL" (ByVal C) (i) '--- Declaration in global Declare Function Interrupt Lib "Labnotes.DLL" (MyRegs as Any, ByVal IntMod) Type Regs AX As Integer BX As Integer CX As Integer DX As Integer SI As Integer DI As Integer SP As Integer DS As Integer ES As Integer Flags As Integer End Type '--- module level code Dim MyRegs as Regs 'dim MyRegs to use with Interrupt. MyRegs.DS = -1 ' -1 tells Interrupt to leave DS, ES and SP MyRegs.ES = -1 ' with their default values MyRegs.SP = -1 MyRegs.AX = &h3000 'assign the service 30h to AX IntMod = &h21 'interrupt 21 Dummy = Interrupt(MyRegs, IntMod) (j) Declare Function SetErrorMode Lib "Kernel.EXE" (ByVal Mode) ' set Error mode to return to function LastMode = SetErrorMode(1) (k) '--- Global declarations Declare Function ControlHwnd Lib "Labnotes.DLL" (hCtl as Control) Declare Function SendMessage Lib "User.EXE" (ByVal hwnd, ByVal Msg, ByVal wParam, ByVal lParam) Global Const LB_ResetContent = &h45 '--- Module level code - sends reset message to List1 Dummy = SendMessage(ControlHwnd(List1), LB_ResetContent, 0, 0) (l) Lss BX, [LP] 'get the pointer to arg Or BX, BX 'check offset for zero Call RegPrint '<<- RegPrint displays registers Jnz @F 'if not zero skip ahead Add BX, CX 'add offset to pointer (m) Declare Sub Monoprint Lib "Labnotes.DLL" (ByVal XString, ByVal Row, ByVal Col, ByVal Attr) </pre>

Figure 3: The `LABNOTES.DLL` code sections indicated by the above parenthesized letters are called out in the article text.

service number for finding the DOS version when using INT 21h—in the AH register. The `Dummy%` variable is only a place holder for this interrupt service, but with many services (such as file access), errors would be reported back as a -1 by the function. In case of an error, the AX register usually contains an error number as well.

One benefit Windows provides when using interrupts is that it traps critical errors—those that cause “Abort, Retry, Ignore” messages in DOS. Windows will return an error to your program, whereas bare-bones DOS requires you to set up your own error-trapping code by revectoring interrupt 24h. Windows also gives you the option of either returning the error to your program as if nothing has happened (in terms of the user) or putting up a window stating the error message. The Windows API call to toggle the type of error trapping is the `SetErrorMode` function. By calling `SetErrorMode` from Visual Basic with a 0, the message box will pop up on errors. If called with a 1, the error returns to the procedure that called the interrupt.

The default that Visual Basic uses is 1, so it usually does not need to be reset. The return value of the function is the value to which it was last set. This is helpful when you want to change the mode and then restore it when you’re finished. The `SetErrorMode` syntax is shown in Figure 3(j).

VISUAL BASIC’S CONTROL HANDLES

The `ControlhWnd%` routine was mentioned earlier when discussing hCtrls. Unlike the other functions presented in this article, `ControlhWnd%` is not an old function revived but is rather a step into the future of BASIC Windows programming.

To call Windows API functions that can add features to Visual Basic controls, the program must provide a handle, `hWnd`, to a window of that control. The `hWnd` is used to send messages to the control, which in turn performs various functions. The Windows documentation lists hundreds of message constants that determine the type of message being sent.

A message constant is a number that, in context, means something to the routine to which it is being sent. For example, if Windows wants a Visual Basic control to paint itself on the screen, it sends a `WM_Paint` message—that is, a 0Fh value. A `WM_SetFocus` message, a 07h value, is sent to set the focus onto the

control. The WM messages, in other words, are nothing more than parameters that are interpreted by the control. The standard Windows message-sending format is made up of four parameters: `hWnd`, `Msg`, `wParam`, and `lParam`.

The `hWnd` is the handle to the messages’s intended window, and `Msg` is the constant just explained above. The `wParam` is a word parameter or integer, and `lParam` is a long parameter or long integer. These latter two are used to pass additional data that support the message. They can represent almost anything, from flags, constants, or other messages to pointers to strings or huge structures of data.

The API `SendMessage` function lets you send messages to access properties and functions of windows and controls.

One benefit Windows provides when using interrupts is that it traps critical errors—those that cause “Abort, Retry, Ignore” messages in DOS.

Again, the key to this function is the `hWnd`, which identifies the window or control for which the message is intended. If the `hWnd` parameter has a value of 0FFFFh or -1, the message will be sent to all top-level windows in the system.

A form is the only object that provides the programmer with an `hWnd` in Visual Basic. The form’s `hWnd` is accessed by using `Form1.hWnd`, replacing the 1 with other form numbers as required. Visual Basic controls are also windows, whose functionality can be extended with `SendMessage` and other functions but which do not have `hWnd` as a property. However, by passing the control name or the pointer to the control structure and then calling the `ControlhWnd` routine from `LABNOTES.DLL`, you can get the `hWnd` of any Visual Basic control. The syntax and use of `ControlhWnd` are illustrated in

Figure 3(k) by a code sample that clears a Visual Basic List Box. In this example, `ControlhWnd` replaces the `hWnd%` parameter in `SendMessage`. `LB_ResetContent` is a Windows message constant. Note that the `wParam` and `lParam` parameters are set to 0 when unused.

DEBUGGING YOUR LIBRARIES

The task of writing a DLL is not really finished until it has been tested and debugged. Visual Basic provides debugging facilities for its programs but not for external DLLs. CodeView is the assembly programmer’s main debugging tool, but the version supplied with MASM does not support Windows.

If you happen to have the Microsoft SDK, you can use CodeView for Windows to debug your programs. CVW can run your application on a color screen and, if you add a second monitor, it will simultaneously display code and debugging information on the monochrome screen. At today’s low prices for monochrome boards and displays, having a second monitor on your system represents a more-than-worthwhile investment.

Lacking the SDK and CodeView, however, you can still debug a DLL by using two routines provided in `LABNOTES.DLL`. `RegPrint` and `MonoPrint` require a monochrome second monitor on which to display CPU register information and strings that will aid you in debugging.

`RegPrint` is called from your assembly language (or C) modules. It displays DEBUG-style register and flag status lines on the first two rows of the monochrome monitor. In order to use `RegPrint`, it must be declared as an `Extern` from the module in which it will be used. The line

```
Extern RegPrint:Far
```

should be placed above the `.CODE` directive in your assembler modules. Once it has been declared, a call to `RegPrint` will display the register status at the point from which it was called.

The code fragment shown in Figure 3(l) illustrates how `RegPrint` can be used to check the status of the flags before a jump. The resulting flag settings from the `Or BX, BX` will be displayed before the `Jnz` instruction is executed. `RegPrint` preserves all flags and registers, and all printing is done with memory moves so that it will not interfere with the program from which it is called. Your only real

concern may need to be about the stack: RegPrint uses 36 bytes of stack space for the duration of the call. Note that RegPrint is not an exported routine, so it cannot be used directly from Visual Basic.

If you want to print an ASCII string, you can call LABNOTES.DLL's MonoPrint routine either from Visual Basic or from your assembler functions. From the Visual Basic environment, MonoPrint lets you monitor variables without using Visual Basic's Debug.Print function. This may be desirable because although the Visual Basic Debug.Print function will print a variable to the immediate window, under some circumstances it can itself cause program malfunctions. When Visual Basic prints to the immediate window, the focus changes from the current form or control to the immediate window. That change of focus can cause erratic behavior in the program, especially when a mouse is involved. The reason for this is that Debug.Print forces a button-release event if the button is currently being pressed. The program may lose track of whether the button is up or down, and it may end up in a loop. The MonoPrint routine, by contrast, only prints the string, and it leaves

the focus where it belongs.

MonoPrint is declared in the General or Global module by using the syntax shown in Figure 3(m). To display a string with MonoPrint, you simply call it with the string you want to print and with the row and column where it is to begin printing. If you are not sure where to print it on the screen, put 0s in the row and column parameters and MonoPrint will always print at position 3,0 on the monochrome screen. The Attr% argument can be used to write highlighted or high-intensity text. If left as a 0, it defaults to color 7, white on black.

REFERENCE MATERIALS

The Windows functions and subroutines presented here have used but a few of the hundreds of Windows API functions that are at your fingertips. To exploit Windows to its fullest, you must invest in adequate documentation. The following books will help you work with Windows. Note that if you do not know C, you should try to learn at least enough to read and understand examples, since most of

the current reference material is written for C programmers.

- *Microsoft Windows Programmers Reference*; Microsoft Press. This is an almost complete listing of the functions and syntax of the Windows API libraries. Note that this one volume contains the same documentation that is included in the Windows SDK reference manuals, Volumes 1 and 2.

- *Microsoft Windows Programmers Guide*; Microsoft Press. The guide gives examples of how to write applications using Version 3 of the Windows API.

- *Programming Windows* (Second Edition), by Charles Petzold; Microsoft Press. This is widely considered the "bible" for learning to write Windows applications. It provides many examples and good explanations of how Windows works.

- *Windows 3: A Developers Guide*, by Jeffrey M. Richter; M&T Publishing. This is a good reference for writing controls in C (not in Visual Basic) that use the printer, MDI, hooks, and other Windows techniques. ■

Jay Munro is a staff programmer and graphic artist at Crescent Software.

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Environments

File I/O under Windows has always been a little peculiar. Until Windows 3.0, the only documented file I/O function in Windows was `OpenFile`, which returned a DOS file handle. This function had the advantage of being able to create a fully qualified path and filename based on the current directory, but it was often clumsy to use.

Some programmers used the DOS file handle obtained from `OpenFile` with the low-level C file I/O functions (read, write, close, and so forth). I took this approach in one of the programs in my book *Programming Windows* (Microsoft Press, 1990). The program worked fine with Microsoft C 6.0, but it had problems when compiled under Borland C++ 2.0. Under Borland's compiler, file handles associated with the low-level C file I/O functions were not the same as the DOS file handles.

Windows programmers often need to use global memory blocks with files. The easiest way to do this is to pass far pointers to file I/O functions. But when you write small- or medium-model programs (which is highly recommended for Windows programming), all the standard C runtime functions accept near pointers.

Windows 3.0 finally documented some file I/O functions (`_lcreate`, `_lopen`, `_lwrite`, `_lread`, `_llseek`, and `_lclose`) that had actually been part of Windows since Version 1.0. These functions accept far pointers and hook almost directly into the equivalent DOS file I/O function calls. They probably have come to be the most commonly used file I/O functions in Windows application programs. It does seem strange, though, to be making raw DOS function calls in the middle of a sophisticated graphical Windows program.

PROBLEMS AND SOLUTIONS

Beyond the actual mechanics of file I/O, Windows posed another problem for programmers who wanted to add file support to their applications. Windows programs should display a File Open dialog

Creating a Computer Drum Machine, Part 3

■ The multimedia I/O functions are specifically tailored for writing and reading RIFF files, and they make the job very easy. We'll take a look here at the routines DRUM uses to handle its data files.

box for the user to select a file, but such dialog boxes proved rather complex to write. Many programmers wished for a standard File Open dialog box to be built into Windows itself.

With Windows 3.1, this finally happened. This version includes a common-dialog-box library that contains dialog-box templates and procedures for opening files, saving files, printing, search-and-replace operations, choosing colors, and choosing fonts. In most cases, all you have to do is set up a structure's fields, pass the structure to a function, and get back your results when the user closes the dialog box.

These dialog boxes are implemented in a dynamic link library called `COMMDLG.DLL`. `COMMDLG.H` is the header file defining the functions and structures, and `COMMDLG.LIB` is the import library for linking the program to use the DLL. Microsoft allows `COMMDLG.DLL` to be shipped with applications that use the common-dialog-box library but continue to run under Windows 3.0. (For

more information on the Windows common-dialog library, see the May 26, 1992, Power Programming column.)

Moreover, because Windows 3.1 includes Multimedia Extensions, it makes available 16 functions, beginning with the prefix `mmio` (multimedia input/output), that are specifically designed for working with RIFF (Resource Interchange File Format) files. As I discussed in the previous column, RIFF files are used to store multimedia data.

FINISHING UP DRUM

With the common-dialog-box library and the `mmio` functions, adding file I/O to DRUM requires little more than the `DRUMFILE.C` module shown in Figure 1. DRUM maintains two filenames: The `szTitleName` variable stores the filename and extension only. This is used for displaying the filename in the title bar of the program's window and in message boxes. The `szFileName` variable stores the fully qualified path and filename and is used for reading from and writing to the file.

`GetOpenFileName` and `GetSaveFileName` are the two functions in the common-dialog-box library that display the dialog boxes. Both of these functions accept structures of type `OPENFILENAME`. Although the structure is large, for typical use most of its fields can be set to 0. Basically, as shown in the functions `DrumFileOpenDlg` and `DrumFileSaveDlg` in `DRUMFILE.C`, you need pointers to buffers to receive the fully qualified filename, the title name, and the size of these buffers, as well as a filter string containing the file types for the dialog.

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MMIO BASICS

In comparison with other sets of file I/O functions, the mmio functions are very versatile. If you like, you can use the mmioOpen, mmioRead, mmioWrite, mmioSeek, and mmioClose functions for general-purpose file I/O. One advantage of mmio over both Windows and C file I/O is that the mmioRead and mmioWrite functions accept huge pointers. You can read or write a global memory block greater

than 64K in one function call. The mmio functions also let you directly manipulate the file I/O buffer, supply your own I/O procedures, and create memory files.

Here I'll restrict use of the mmio functions to those few required for writing and reading RIFF files. As I described last time, RIFF files are composed of nested chunks of information, each of

which has a chunk type (a four-character name), a chunk size (32 bits long), and chunk data. I also presented the RDUMP program, which displays the layout of a RIFF file. Figure 2 shows RDUMP output for one of DRUM's data files.

The DRUM data file uses a form type of DRUM. As recommended in the *Microsoft Windows Multimedia Programmer's Reference*, I registered this form type with the Product Marketing area of the Multi-

DRUMFILE.C

1 OF 2

```

/*-----
DRUMFILE.C -- File I/O Routines for DRUM
(c) Charles Petzold, 1992
-----*/

#include <windows.h>
extern "C" {
#include <mmsystem.h>
#include <comdlg.h>
}
#include <stdlib.h>
#include <string.h>
#include <time.h>
#include "drumdl.h"
#include "drumfile.h"

OPENFILENAME ofn = { sizeof (OPENFILENAME) };

char * szFilter[] = { "Drum Files (*.DRM)", "*.drm", "" };

char szDrumID [] = "DRUM";
char szListID [] = "LIST";
char szInfoID [] = "INFO";
char szSoftID [] = "ISFT";
char szDateID [] = "ISCD";
char szFmtID [] = "fmt ";
char szDataID [] = "data";

char szSoftware [] = "DRUM by Charles Petzold, "
    "PC Magazine, Vol. 11, Nos. 9-12";

char szErrorNoCreate [] = "File %s could not be opened for writing.";
char szErrorCannotWrite [] = "File %s could not be written to. Disk full.";
char szErrorNotFound [] = "File %s not found or cannot be opened.";
char szErrorNotDrum [] = "File %s is not a standard DRUM file.";
char szErrorUnsupported [] = "File %s is not a supported DRUM file.";
char szErrorCannotRead [] = "File %s cannot be read.";

BOOL DrumFileParse (char * szFileName, char * szTitleName)
{
    static char szBuffer [_MAX_PATH];

    if (_fullpath (szBuffer, szFileName, _MAX_PATH))
    {
        strcpy (szBuffer, szFileName);

        if (!GetFileTitle (szBuffer, szTitleName, _MAX_FNAME + _MAX_EXT))
            return TRUE;
    }

    return FALSE;
}

BOOL DrumFileOpenDlg (HWND hwnd, char * szFileName, char * szTitleName)
{
    ofn.hwndOwner = hwnd;
    ofn.lpstrFilter = szFilter [0];
    ofn.lpstrFile = szFileName;
    ofn.nMaxFile = _MAX_PATH;
    ofn.lpstrFileTitle = szTitleName;
    ofn.nMaxFileTitle = _MAX_FNAME + _MAX_EXT;
    ofn.Flags = OFN_CREATEPROMPT;
    ofn.lpstrDefExt = "drm";

    return GetOpenFileName (&ofn);
}

BOOL DrumFileSaveDlg (HWND hwnd, char * szFileName, char * szTitleName)
{
    ofn.hwndOwner = hwnd;
    ofn.lpstrFilter = szFilter [0];
    ofn.lpstrFile = szFileName;
    ofn.nMaxFile = _MAX_PATH;
    ofn.lpstrFileTitle = szTitleName;
    ofn.nMaxFileTitle = _MAX_FNAME + _MAX_EXT;
    ofn.Flags = OFN_OVERWRITEPROMPT;
    ofn.lpstrDefExt = "drm";

    return GetSaveFileName (&ofn);
}

char * DrumFileWrite (DRUM * pdrum, char * szFileName)
{
    char szDateBuf [16];

    MMIO
    long
    MMCKINFO
    struct tm * tmTime;
    time t
    WORD
    wError = 0;

    memset (mmckinfo, 0, 3 * sizeof (MMCKINFO));

    // Recreate the file for writing

    if ((hmmio = mmioOpen (szFileName, NULL,
        MMIO_CREATE | MMIO_WRITE | MMIO_ALLOCBUF)) == NULL)
        return szErrorNoCreate;

    // Create a "RIFF" chunk with a "CPDR" type

    mmckinfo[0].fccType = mmioStringToFOURCC (szDrumID, 0);

    wError |= mmioCreateChunk (hmmio, &mmckinfo[0], MMIO_CREATELIST);

    // Create "LIST" sub-chunk with an "INFO" type

    mmckinfo[1].fccType = mmioStringToFOURCC (szInfoID, 0);

    wError |= mmioCreateChunk (hmmio, &mmckinfo[1], MMIO_CREATELIST);

    // Create "ISFT" sub-sub-chunk

    mmckinfo[2].ckid = mmioStringToFOURCC (szSoftID, 0);

    wError |= mmioCreateChunk (hmmio, &mmckinfo[2], 0);
    wError |= (mmioWrite (hmmio, szSoftware, sizeof (szSoftware)) !=
        sizeof (szSoftware));
    wError |= mmioAscend (hmmio, &mmckinfo[2], 0);

    // Create a time string

    time (<tmTime>);
    tmTime = localtime (<tmTime>);

    wprintf (szDateBuf, "%04d-%02d-%02d",
        tmTime->tm_year + 1980, tmTime->tm_mon + 1, tmTime->tm_mday);

    // Create "ISCD" sub-sub-chunk

    mmckinfo[2].ckid = mmioStringToFOURCC (szDateID, 0);

    wError |= mmioCreateChunk (hmmio, &mmckinfo[2], 0);
    wError |= (mmioWrite (hmmio, szDateBuf, strlen (szDateBuf) + 1) !=
        (long) strlen (szDateBuf) + 1);
    wError |= mmioAscend (hmmio, &mmckinfo[2], 0);
    wError |= mmioAscend (hmmio, &mmckinfo[1], 0);

    // Create "fmt " sub-chunk

    mmckinfo[1].ckid = mmioStringToFOURCC (szFmtID, 0);

    wError |= mmioCreateChunk (hmmio, &mmckinfo[1], 0);
    wError |= (mmioWrite (hmmio, (LPSTR) szFormat, sizeof (long)) !=
        sizeof (long));
    wError |= mmioAscend (hmmio, &mmckinfo[1], 0);

    // Create the "data" sub-chunk

    mmckinfo[1].ckid = mmioStringToFOURCC (szDataID, 0);

    wError |= mmioCreateChunk (hmmio, &mmckinfo[1], 0);
    wError |= (mmioWrite (hmmio, (LPSTR) pdrum, sizeof (DRUM)) !=
        sizeof (DRUM));
    wError |= mmioAscend (hmmio, &mmckinfo[1], 0);
    wError |= mmioAscend (hmmio, &mmckinfo[0], 0);

    // Clean up and return

    wError |= mmioClose (hmmio, 0);

    if (wError)
    {
        mmioOpen (szFileName, NULL, MMIO_DELETE);
        return szErrorCannotWrite;
    }

    return NULL;
}

```

Figure 1: This listing contains the source code for DRUM's file I/O logic.


```

}
char * DrumFileRead (DRUM * pdrum, char * szFileName)
{
    DRUM    drum ;
    MMIO     hmmio ;
    long     lFormat ;
    MMCKINFO mmckinfo {3} ;

    memset (&mmckinfo, 0, 2 * sizeof (MMCKINFO)) ;

    // Open the file

    if ((hmmio = mmioOpen (szFileName, NULL, MMIO_READ)) == NULL)
        return szErrorNotFound ;

    // Locate a "RIFF" chunk with a "DRUM" form-type

    mmckinfo[0].ckid = mmioStringToFOURCC (szDrumID, 0) ;

    if (mmioDescend (hmmio, &mmckinfo[0], NULL, MMIO_FINDRIFF))
    {
        mmioClose (hmmio, 0) ;
        return szErrorNotDrum ;
    }

    // Locate, read, and verify the "fmt" sub-chunk

    mmckinfo[1].ckid = mmioStringToFOURCC (szFmtID, 0) ;

    if (mmioDescend (hmmio, &mmckinfo[1], &mmckinfo[0], MMIO_FINDCHUNK))
    {
        mmioClose (hmmio, 0) ;
        return szErrorNotDrum ;
    }

    if (mmckinfo[1].cksize != sizeof (long))
    {
        mmioClose (hmmio, 0) ;
        return szErrorUnsupported ;
    }

    if (mmioRead (hmmio, (LPSTR) &lFormat, sizeof (long)) != sizeof (long))
    {
        mmioClose (hmmio, 0) ;
        return szErrorCannotRead ;
    }

    if (lFormat != 1)
    {
        mmioClose (hmmio, 0) ;
        return szErrorUnsupported ;
    }

    // Go to end of "fmt" sub-chunk

    mmioAscend (hmmio, &mmckinfo[1], 0) ;

    // Locate, read, and verify the "data" sub-chunk

    mmckinfo[1].ckid = mmioStringToFOURCC (szDataID, 0) ;

    if (mmioDescend (hmmio, &mmckinfo[1], &mmckinfo[0], MMIO_FINDCHUNK))
    {
        mmioClose (hmmio, 0) ;
        return szErrorNotDrum ;
    }

    if (mmckinfo[1].cksize != sizeof (DRUM))
    {
        mmioClose (hmmio, 0) ;
        return szErrorUnsupported ;
    }

    if (mmioRead (hmmio, (LPSTR) &drum, sizeof (DRUM)) != sizeof (DRUM))
    {
        mmioClose (hmmio, 0) ;
        return szErrorCannotRead ;
    }

    // Close the file and copy the DRUM structure data

    mmioClose (hmmio, 0) ;

    memcpy (pdrum, &drum, sizeof (DRUM)) ;
    return NULL ;
}

```

media Systems Group at Microsoft.

Although you can create RIFF files using normal file I/O functions, calculating and storing the chunk sizes can be a nuisance. That's one of the things the mmio functions handle very well. When reading a RIFF file, the mmio functions also hide the process of skipping over unnecessary chunks.

When you open a file using the mmio functions, you get a file handle of type HMMIO. Don't attempt to use this handle with DOS file I/O function calls or C file functions.

The four-character chunk names, form types, and list types are treated as 32-bit integers in the mmio functions. These have a data type of FOURCC, which stands for four-character code.

Two methods are provided for obtaining a 32-bit integer from characters or strings. One approach is to use the following macro:

```

FOC = mmioFOURCC (ch1, ch2, ch3,
ch4) ;

```

The four parameters are the four characters individually; for example:

```

FOC = mmioFOURCC ('W', 'A', 'V',
'E') ;

```

You can also use a function that accepts an entire string:

```

FOC = mmioStringToFOURCC (szFOC,
wFlag) ;

```

In this case:

```

FOC = mmioStringToFOURCC ("WAVE",
0) ;

```

The wFlag parameter can be MMIO_TOUPPER to make the characters of the string uppercase before conversion.

Some of the mmio functions require a pointer to a structure of type MMCKINFO (multimedia chunk information). This structure is shown in Figure 3. In the examples below, I'll use the variable name mmckinfo as a structure of type MMCKINFO.

CREATING A RIFF FILE

To open a file using the mmio functions, the first step is to call

```

hmmio = mmioOpen (szFileName,
&mmckinfo, dwFlags) ;

```

The function returns a handle to the file. The second parameter can be a pointer to

an MMIOINFO structure (not the MMCKINFO structure discussed above), but in many cases you can set that parameter to NULL. The dwFlags parameter specifies whether you want to create the file or open the file for reading or writing; it also lets you indicate sharing modes and other information.

The following function creates a chunk in the file:

```

wError = mmioCreateChunk (hmmio,
&mmckinfo, wFlags) ;

```

There are two ways to use this function: If you are creating a chunk that is not a RIFF chunk or a LIST chunk, prepare for the call by doing the following:

- Set the ckid field of the MMCKINFO structure to the four-character code of the chunk type.
- Optionally set the cksize field to the chunk size of the data in the chunk.
- Set the wFlags parameter of mmioCreateChunk to 0.

In this case, mmioCreateChunk writes 8 bytes to the file—the chunk type (from the ckid field) and the chunk size (from the cksize field). The file pointer is left positioned at the end of the chunk size.

If you are creating a RIFF or a LIST chunk, then prepare as follows:

PROGRAMMING ENVIRONMENTS

- Set the fccType field of the MMCKINFO structure to the four-character code of the form type (for a RIFF chunk) or the list type (for a LIST chunk).
- Optionally set the cksize field to the chunk size of the data in the chunk.
- Set the wFlags parameter of the function to MMIO_CREATERIFF or MMIO_CREATELIST to create a RIFF chunk or a LIST chunk.

In this case, mmioCreateChunk writes 12 bytes to the file—the chunk-type ("RIFF" or "LIST"), chunk size (from the cksize field), and form type (from the fccType field). The file pointer is left positioned at the end of the form type.

In either case, you don't have to set

the cksize field of the structure. The file's chunk-size field can be filled in at a later time by calling mmioAscend (as we'll see). On return from the mmioCreateChunk function, the file pointer and the dwDataOffset field of the structure will be set to the beginning of the chunk-data area relative to the beginning of the file.

Next write the chunk data using

```
lWritten = mmioWrite (hmmio,
    pData, lSize) ;
```

The pointer can be to a memory block greater than 64K. The size of the data is

given in the last parameter, and the function returns the number of bytes written. This may be less than the number of bytes requested if you run out of disk space.

After writing the chunk data, you call

```
wError = mmioAscend (hmmio,
    &mmckinfo, 0) ;
```

The mmioAscend function has two distinct purposes, one when reading a RIFF file and another when writing to one. When use in conjunction with mmioCreateChunk and mmioWrite while writing to a file, mmioAscend fills in the chunk size for the chunk originally created by mmioCreateChunk. The MMCKINFO structure passed to mmioAscend must be the same MMCKINFO structure passed earlier to mmioCreateChunk to create the chunk. The mmioAscend function works by subtracting the dwDataOffset field of the structure from the current file pointer (which will now be at the end of the chunk data) and storing that value before the data. The mmioAscend function also takes care of data padding if the chunk data is not a multiple of 2 bytes in length.

RIFF files are composed of nested levels

A SAMPLE .DRM FILE

```
\text\env\11-09\sample.drm

RIFF 0000-01F8 DRUM
LIST 0000-005A INFO
    ISFT 0000-0039 "DRUM by Charles Petzold," ...
    ISCD 0000-000B "1992-02-16"
    fmt 0000-0004 01 00 00 00
    data 0000-017E 3F 00 40 00 20 00 01 01 ...
```

Figure 2: The structure of the DRUM data files, as shown by the RDUMP program.



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of chunks. For mmioAscend to work correctly, you must maintain multiple MMCKINFO structures, each of which is associated with a level in the file. The DRUM data files have three levels. Hence, in the DrumFileWrite function in DRUMFILE.C, I've defined an array of three MMCKINFO structures, which can be referenced as mmckinfo[0], mmckinfo[1], and mmckinfo[2].

Mmckinfo[0] is used in the first mmioCreateChunk call to create a RIFF chunk type with a DRUM form type. This is followed by a second mmioCreateChunk call using mmckinfo[1] to create a LIST chunk type with an INFO list type.

A third mmioCreateChunk call using mmckinfo[2] creates a chunk type of ISFT, identifying the software that created the data file. Following the mmioWrite call to write the string szSoftware, a call to mmioAscend using mmckinfo[2] fills in the chunk size field for this chunk. This is the first completed chunk.

The next chunk is also within the LIST chunk. The program proceeds with another mmioCreateChunk call to create an ISCD (creation data) chunk, using mmckinfo[2]. After the mmioWrite call to write

the chunk data, a call to mmioAscend using mmckinfo[2] fills in the chunk size.

That's the end of this chunk, and it is also the end of the LIST chunk. To fill in

After a successful
mmioOpen call,
nothing can really go
wrong except running
out of disk space.

the chunk-size field of the LIST chunk, mmioAscend is called again, this time using mmckinfo[1], which was originally used to create the LIST chunk.

To create the "fmt" and "data" chunks, mmioCreateChunk uses mmckinfo[1]; the mmioWrite calls are followed by mmioAscend, also using mmckinfo[1]. Now

all the chunk sizes have been filled in except for the RIFF chunk itself. That requires one more call to mmioAscend using mmckinfo[0]. There's only one call left, and that's to mmioClose.

It probably seems as if an mmioAscend call changes the current file pointer, and it certainly may in order to fill in the chunk size, but by the time the function returns, the file pointer is restored to its position at the end of the chunk data (or perhaps incremented by 1 byte for data padding). All writing to the file is sequential from beginning to end.

After a successful mmioOpen call, nothing can really go wrong except running out of disk space. I use the variable wError to accumulate error codes from the mmioCreateChunk, mmioWrite, mmioAscend, and mmioClose call, each of which could fail if insufficient disk space is available. If that happens, the file is deleted using mmioOpen with the MMIO_DELETE constant, and an error message is returned to the caller.

READING A RIFF FILE

Reading a RIFF file is similar to creating one, except that mmioRead is called instead

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of `mmioWrite`, and `mmioDescend` is called rather than `mmioCreateChunk`. To *descend* into a chunk means to locate a chunk and put the file pointer after the chunk size (or after the form type or list type for a RIFF or LIST chunk type). To *ascend* from a chunk means to move the file pointer to the end of the chunk data. Neither the `mmioDescend` nor `mmioAscend` functions move the file pointer to an earlier position in the file.

The documentation for `mmioDescend` is confusing. Let's use a cookbook approach to examine the function: You want a separate `MMCKINFO` structure for each level in the file. I'll refer to these structures as `mmckinfo[0]`, `mmckinfo[1]`, and `mmckinfo[2]`. The first thing to do after opening a file is to verify that it is in the RIFF format and, optionally, that the form type is the one you want. If you're only interested in a specific form type, set the `fccType` field of the `MMCKINFO` structure to that form type and call

```
wError = mmioDescend (hmmio,
    &mmckinfo[0], NULL,
    MMIO_FINDRIFF) ;
```

Watch out: The documentation indicates that the `ckid` field should be set to the form type. But the `mmioDescend` function called with the `MMIO_FINDRIFF` parameter does not even check that field. If the `fccType` field is not set to a form type, `mmioDescend` will return successfully for a RIFF file with any form type. Then you will have to check the `fccType` field explicitly.

After this function call, the `ckid` field will contain "RIFF", the `cksize` field will have the chunk size, the `fccType` will be the form type you specified (or the form type of the file), and `dwDataOffset` will indicate the position in the file just after the form type (that is, 12 bytes).

Now you're ready to search for chunk types within the RIFF chunk. If the chunk types that interest you occur in a fixed

order (as in a waveform audio file or a DRUM file, where the "fmt" chunk must precede the "data" chunk), set the `ckid` field of the `mmckinfo[1]` structure to the first chunk type you need (for example, the four-character code for "fmt") and call

```
wError = mmioDescend (hmmio,
    &mmckinfo[1],
    &mmckinfo[0],
    MMIO_FINDCHUNK) ;
```

The third parameter indicates a "parent" chunk as defined by the `MMCKINFO` structure. Notice that the last parameter is

To descend into a chunk means to locate a chunk and put the file pointer after the chunk size. To ascend from a chunk means to move the file pointer to the end of the chunk data.

`MMIO_FINDCHUNK`. After this function call, the fields of the `mmckinfo[1]` structure are set as follows: `ckid` is the chunk type you specified, `cksize` is the size of the chunk, `fccType` is set to 0, and `dwOffset` indicates the offset from the beginning of the file to the beginning of the chunk data.

Now you can read the chunk using `mmioRead`:

```
lRead = mmioRead (hmmio, pData,
    lSize) ;
```

After reading the chunk data, call

```
mmioAscend (hmmio, mmckinfo[1], 0) ;
```

This moves the file pointer to the end of the chunk data, accounting for possible padding. You can now search for the next chunk you need using `mmioDescend`, read it with `mmioRead`, and move to the end of the chunk data with `mmioAscend`.

If the ordering of the chunk types is not defined, set the `ckid` field of the `mmckinfo[1]` structure to 0 before calling the `mmioDescend` function with the `MMIO_FINDCHUNK` parameter. The function will find the next subchunk, and you can then check the `ckid` field of the structure to determine the chunk type. If you're not interested in the chunk, call `mmioAscend` and `mmioDescend` again. `mmioDescend` will return an error code if no more subchunks are present.

If the chunk type is "LIST", `mmioDescend` will correctly increment the file pointer to follow the form type. You can check the `fccType` field of the `mmckinfo[1]` structure for the list type. If you're interested in this list type, you can descend into the subchunks by calling the `mmioDescend` function with `mmckinfo[3]`. (The chunks probably won't be in a specific order, so you will set the `ckid` field to 0L.) Otherwise, just call `mmioAscend` with `mmckinfo[2]` to skip the LIST chunk.

You can also search for a specific LIST type by calling `mmioDescend` with the `MMIO_FINDLIST` parameter. If you are interested in a particular list type, set the `fccType` field of the `MMCKINFO` structure to that list type.

DRUM is interested only in the "fmt" and "data" chunks of the RIFF file it uses for storing data. The code in `DRUMFILE.C` follows the cookbook approach, and most of the work involves verifying that the file follows the correct format.

COMING UP: MIDI INPUT

If you attach a MIDI keyboard (or other MIDI controller) to the MIDI In port of a MIDI board, you can also use Multimedia Windows to read MIDI messages. In the next column, we'll begin an exploration of MIDI input. ■

STRUCTURE OF TYPE MMCKINFO

```
typedef struct _MMCKINFO
{
    FOURCC ckid ;           // chunk type (ID)
    DWORD cksize ;          // chunk size
    FOURCC fccType ;         // form type or list type
    DWORD dwDataOffset ;    // from beginning of file
    DWORD dwFlags ;         // 0 or MMIO_DIRTY
}
MMCKINFO
```

Figure 3: The multimedia chunk information structure used in the `mmio` functions.

by
Ray Duncan

Power Programming

The Windows Common Dialog Search-and-Replace Functions

As I write this, Windows 3.1 (along with its archcompetitor OS/2 2.0) is finally emerging from beta testing into the retail channel, accompanied by an advertising blitz that has no parallel in personal computing history. It's too early to guess how the battle for market share between Microsoft and IBM will play out, but it's clear that the schism between these two companies has had many beneficial effects—even if it has anguished some developers. The bitter competition between the two companies provoked the evolution of Windows and OS/2 at a rate that is nothing short of extraordinary (after years in the doldrums), and both companies evince a new sensitivity for users' priorities, concerns, and pocketbooks.

At first glance, the so-called common dialogs of Windows 3.1 seem like a relatively minor enhancement compared with TrueType or OLE (object linking and embedding), but you should not underestimate their importance. The user interactions supported by the common dialogs—opening or saving a file, choosing a font or color, setting up the printer, and specifying search-and-replace strings—are functions needed by almost every application. The effort involved in designing, implementing, and testing even one of these dialogs is significant, especially for developers (like me) who are still making the transition from traditional character-oriented programming. Those developers can now channel their energy into the core logic of their applications. The common dialogs are a boon to users as well, because they reduce the size of each application's .EXE file, standardize the user interface across vendors, and shorten the learning curve for new applications.

The Windows 3.1 common dialogs are implemented in the dynamic link library `COMMDDL.DLL`, which Microsoft distributes in the Windows 3.1 retail package and also licenses for vendors to ship with Windows 3.0-compatible applications. In the last two columns, I've cov-

■ Our demonstration program is expanded once again to take advantage of the common dialogs for text editing, and it provides a basis for examining these functions.

ered the common dialog functions `GetOpenFileName()`, `GetSaveFileName()`, `ChooseColor()`, and `ChooseFont()`, along with their associated data structures. I've also provided two iterations of a simple demonstration program (`DLGDEMO`) to show you how to use the functions.

Here, we'll examine the common dialog functions for text editing, `FindText()` and `ReplaceText()`, and we'll add a little more logic to `DLGDEMO` to take advantage of them. These two latest dialogs differ from the other four in one important respect: They are so-called *modeless dialogs*. Let's digress for a moment to talk about what *modeless* really means.

MODELESS AND MODAL DIALOGS

If you've ever used *Microsoft Word* for Windows' search or search-and-replace facilities, you've probably noticed something unusual about the dialogs that accept the search target strings and replacement strings. Unlike the more familiar dialogs that vanish from the screen when you click an OK or Cancel button, these dialogs just hang around on the

screen until you explicitly close them or place some other application's window in front of them. These are known as *modeless dialogs*, and you can best understand them by contrasting them with their opposites, *modal dialogs*.

When a modal dialog, such as the *OpenFile* common dialog, is on the screen, the user's previous working context is suspended, and the interaction with the computer enters a new and sharply constrained *mode*. The user can only click on objects or type into editing fields that are contained within the active dialog. Attempts to carry out other operations within the same program, such as picking some item from the main menu bar, are rejected (usually with a nasty beep) until the dialog is completed and dismissed from the screen with the appropriate keystroke or button. System-modal dialogs won't even let you switch the input focus to another application program.

A *modeless* dialog, on the other hand, does not trap users in some kind of Phantom Zone. You can move back and forth between the main application window and the dialog as circumstances demand, simply by clicking with the mouse on the window you want to make active, pushing the dialog out of the way if necessary. The dialog and the main application window each maintain their contexts on behalf of the user, but they don't insist you finish one task before working on another.

The observation that a modeless dialog behaves like an ordinary application window serves to illustrate a very important but rarely mentioned fact: Although dialogs and their templates and message



THE FINDREPLACE STRUCTURE

Field name	Description
IStructSize	Specifies the structure's length in bytes (used as a sanity check by Windows).
hwndOwner	The handle for the window that owns the dialog box. The message handler for the specified window will be notified when the user interacts with the modeless dialog.
hInstance	Identifies the data block containing a custom dialog template. Ignored if the FR_ENABLETEMPLATE or FR_ENABLETEMPLATEHANDLE bit is not set in the Flags field.
Flags	Contains various option flags that affect the initialization and behavior of the common dialog.
lpstrFindWhat	The address of the buffer that receives the search string.
lpstrReplaceWith	The address of the buffer that receives the string replacing the search target. Ignored by FindText().
wFindWhatLen	The length of the buffer receiving the search string.
wReplaceWithLen	The length of the buffer receiving the replacement string. Ignored by FindText().
lCustData	Specifies application-defined data that will be passed to the function designated by the lpfnHook field.
lpfnHook	The address of the application's dialog "hook" function. Ignored if the FR_ENABLEHOOK bit is not set in the Flags field.
lpTemplateName	Points to a string that specifies the resource filename for a custom dialog template. Ignored if the FR_ENABLETEMPLATE bit is not set in the Flags field.

Figure 1: The fields of this structure are used by the FindText() and ReplaceText() dialogs.

handlers appear to be complex, magical system objects, they are constructed from the same basic building blocks as the simplest Windows application. Dialogs, whether modal or modeless, are merely windows with a peculiar border style and a special default message handler. Similarly, the controls within dialogs are just child windows that are members of predefined global

classes with, again, some rather clever but totally understandable class-specific message handlers.

From a software developer's point of view, modeless dialogs are no more difficult to manage than modal dialogs. The templates for modeless dialogs are designed and compiled exactly like those of their modal counterparts. The differences

- at the application structure and source-code level can be summarized thus:
- The dialog style for a modeless dialog should include a title bar (to move the dialog), a system menu (to close the dialog), and the WS_VISIBLE flag.
 - A modeless dialog is activated with CreateDialog() or CreateDialogIndirect() rather than the DialogBox() or DialogBoxIndirect() used for modal dialogs.
 - Messages from a modeless dialog come through the application's main message queue, and they must be dispatched to the dialog-box handler with a call to IsDialogMessage() in the event loop.
 - Programmers must be more careful about code reentrancy, because it's possible for the modeless dialog handler and other parts of the application to make overlapping calls to the same routine, or even for multiple copies of the same modeless dialog to be active simultaneously in the same application instance.
 - A modeless dialog is removed from the screen by a call to DestroyWindow() rather than EndDialog().
- Considering how easily you can implement modeless dialogs and how much freedom they give, it's too bad they are so underutilized.

USING FINDTEXT() AND REPLACETEXT()

The fundamental steps in using the FindText() and ReplaceText() common dialogs are straightforward. First you allocate a FINDREPLACE data structure for passing information between the application and COMMDLG.DLL. Then you call the appropriate function entry point, passing a far pointer to the structure. (The fields of the FINDREPLACE structure are listed in Figure 1.) Here is the skeleton for a

DLGDEMO3.C

1 OF 2

```

// DLGDEMO3.C -- Common Dialog Demo #3 for Windows 3.1
// Copyright 1992 Ray Duncan
// Cliff Davis Publishing • PC Magazine

.
.
.

FINDREPLACE fr;                // common dialog data structure
HWND hFind = (HWND) 0;         // nomodal dialog handle
char szFind[256];              // text to find
char szReplace[256];           // text to replace

.
.
.

struct decodeWord {              // structure associates
    WORD Code;                  // messages or menu IDs
    LONG (*Fxn)(HWND, WORD, WORD, LONG); // with a function
};

//
// Table of window messages supported by FramewndProc()
// and the functions which correspond to each message.
//
struct decodeWord messages[] = {
    0, DoFindReplace,
    WM_CREATE, DoCreate,
    WM_INITMENU, DoInitMenu,
    WM_SETFOCUS, DoSetFocus,
    WM_SIZE, DoSize,
    WM_COMMAND, DoCommand,
    WM_DESTROY, DoDestroy,
    WM_CTLCOLOR, DoSetColor, };

//
// Table of menubar item IDs and their corresponding functions.
//
struct decodeWord menuitems[] = {
    IDM_NEW, DoMenuNew,
    IDM_OPEN, DoMenuOpen,
    IDM_SAVE, DoMenuSave,
    IDM_SAVEAS, DoMenuSaveAs,
    IDM_EXIT, DoMenuExit,
    IDM_UNDO, DoMenuUndo,
    IDM_CUT, DoMenuCut,
    IDM_COPY, DoMenuCopy,
    IDM_PASTE, DoMenuPaste,
    IDM_DELETE, DoMenuDelete,
    IDM_FIND, DoMenuFind,
    IDM_REPLACE, DoMenuReplace,
    IDM_FONT, DoMenuFont,
    IDM_COLOR, DoMenuColor, };
  
```

Figure 2: Here are extracts from the source code, showing the routines specific to the program's search-and-replace functions.

DLGDEMO3.C

2 OF 2

```
//
// InitInstance --- instance initialization code for this application.
//
BOOL InitInstance(HANDLE hInstance, WORD nCmdShow)
{
    .
    .
    // register message for FindText() and ReplaceText() common dialogs
    messages[0].Code = RegisterWindowMessage((LPSTR) FINDMSGSTRING);
    .
    .
    return(TRUE); // return success flag
}

//
// DoFindReplace -- process WM_FINDMSGSTRING message from nonmodal
// FindText() AND ReplaceText() common dialogs. Dispatch DoFind()
// or DoReplace() according to flags in FINDREPLACE structure.
//
LONG DoFindReplace(HWND hWnd, WORD wParam, WORD lParam, LONG lParam)
{
    if(fr.Flags & FR_DIALOGTERM) // is dialog being destroyed?
    {
        hFind = 0; // yes, reset window handle
        return(0); // allowing another dialog
    } // be created

    if(fr.Flags & FR_FINDNEXT) // no, perform find or replace
        return(DoFind(hWnd, wParam, lParam));
    else if(fr.Flags & (FR_REPLACE | FR_REPLACEALL))
        return(DoReplace(hWnd, wParam, lParam));
    else
        return(DefWindowProc(hWnd, wParam, lParam));
}

//
// DoFind -- process find command from modeless FindText dialog
//
LONG DoFind(HWND hWnd, WORD wParam, WORD lParam)
{
    if(!FindString()) // search for string
        MessageBox(hFrame, // complain if no match
            "Can't find string!", szAppName, MB_ICONSTOP | MB_OK);
    SetFocus(hEdit); // restore input focus
    return(0);
}

//
// DoReplace -- process replace or replace-all command from
// modeless FindReplace dialog
//
LONG DoReplace(HWND hWnd, WORD wParam, WORD lParam)
{
    int i = 0; // replacement counter
    char buff[80]; // scratch buffer

    if(fr.Flags & FR_REPLACEALL) // replace multiple?
    {
        while(FindString()) // yes, while another match
        {
            // exists, replace it
            SendMessage(hEdit, EM_REPLACESEL, 0, (LPSTR) szReplace);
            i++; // and count replacements
        }

        wprintf(buff, "%d replacements made.", i);
        MessageBox(hFrame, // show counter to user
            buff, szAppName, MB_ICONEXCLAMATION | MB_OK);
    }
    else // this is single replace
    {
        if(!FindString()) // search for string
            MessageBox(hFrame, // complain if no match
                "Can't find string!", szAppName, MB_ICONSTOP | MB_OK);
        else // otherwise replace it
            SendMessage(hEdit, EM_REPLACESEL, 0, (LPSTR) szReplace);
    }

    SetFocus(hEdit); // restore input focus
    return(0);
}

}

//
// FindString -- search edit control from current selection point for
// the string in szFind[]. If string is present, set selection to include
// match and return TRUE, otherwise return FALSE.
//
BOOL FindString(VOID)
{
    LONG sel; // current selection
    int begSel, endSel, cText, csch; // scratch variables
    int schDir = 1; // search direction
    PSTR pText, pWork; // scratch pointers
    HANDLE hText; // local heap handle
    int (*matcher)(PSTR, PSTR, WORD); // pointer to match function

    // get handle for memory block, convert to pointer, get text length
    hText = (HANDLE) SendMessage(hEdit, EM_GETHANDLE, 0, 0);
    pText = LocalLock(hText);
    cText = (WORD) SendMessage(hEdit, WM_GETTEXTLENGTH, 0, 0);

    if(cText == 0) return(FALSE); // bail out if no text at all

    // get offset of beginning and end of current selection
    sel = SendMessage(hEdit, EM_GETSEL, 0, 0);
    begSel = LOWORD(sel);
    endSel = HIWORD(sel);

    // set search direction from flags in FINDREPLACE structure
    schDir = fr.Flags & FR_DOWN ? 1 : -1;

    // select case-sensitive or case-insensitive match function
    matcher = fr.Flags & FR_MATCHCASE ? strcmp : strnicmp;

    // calculate search starting point within text block
    pWork = pText + begSel + schDir;

    // calculate length of text to search
    csch = schDir < 0 ? begSel : max(cText - begSel + 1 - strlen(szFind), 0);

    while(csch > 0) // search until match found
    {
        if((*matcher)(pWork, szFind, strlen(szFind)) == 0)
        {
            LocalUnlock(hText); // found a match, select it
            begSel = pWork - pText;
            endSel = begSel + strlen(szFind);
            SendMessage(hEdit, EM_SETSEL, 0, MAKELONG(begSel, endSel));
            return(TRUE); // return success flag
        }

        csch--; // no match yet, adjust text
        pWork += schDir; // address & length remaining
    }

    LocalUnlock(hText); // unlock edit control text
    return(FALSE); // return match failed flag
}

//
// DoMenuFind -- process Search-Find command from menu bar.
//
LONG DoMenuFind(HWND hWnd, WORD wParam, WORD lParam)
{
    fr.lStructSize = sizeof(FINDREPLACE); // length of structure
    fr.hwndOwner = hWnd; // handle of owner window
    fr.Flags = FR_DOWN; // option flags
    fr.lpstrFindWhat = szFind; // string to find
    fr.wFindWhatLen = sizeof(szFind); // length of find buffer

    hFind = FindText(&fr); // activate FindText dialog
    return(0);
}

//
// DoMenuReplace -- process Search-Replace command from menu bar.
//
LONG DoMenuReplace(HWND hWnd, WORD wParam, WORD lParam)
{
    fr.lStructSize = sizeof(FINDREPLACE); // length of structure
    fr.hwndOwner = hWnd; // handle of owner window
    fr.Flags = FR_DOWN; // option flags
    fr.lpstrFindWhat = szFind; // string to find
    fr.wFindWhatLen = sizeof(szFind); // length of find buffer
    fr.lpstrReplaceWith = szReplace; // replacement string
    fr.wReplaceWithLen = sizeof(szReplace); // length of replace buffer

    hFind = ReplaceText(&fr); // activate ReplaceText dialog
    return(0);
}

```

call to the FindText() function:

```
FINDREPLACE fr;
HWND hWnd;
.
.
.
hWnd = FindText(&fr);
```

Even at this level of abstraction, you can see an important difference between FindText() or ReplaceText() and the modal common dialogs such as GetOpenFileName(). Since FindText() and ReplaceText() create a modeless dialog, the dialog box is still on the screen when the functions return. Consequently, instead

of returning a "status" in the style of GetOpenFileName(), the FindText() and ReplaceText() functions return a window handle for the dialog box. The application is then free to go about its business or yield control to another program. It's important to note that the FINDREPLACE structure needs to be allocated statically

so that it will not vanish (and cause a disaster) after the routine that calls FindText() or ReplaceText() returns to its caller.

When the user enters a search and/or a replace string into the dialog box and clicks one of the Find or Replace buttons, the application is notified by a message to the handler for the window that it specified in the FINDREPLACE structure. This message number is not a fixed, predetermined value like the message number for WM_CLOSE or WM_LBUTTONDOWN, though; instead, the message number is allocated at the application's runtime. The application obtains the message number by calling RegisterWindowMessage() in its instance initialization code, using a string defined in the COMM32.H file:

```
WORD frmeg;  
.  
.  
.  
frmeg =  
    RegisterWindowMessage((LPSTR)  
    FINDMSGSTRING);
```

When the message from the FindText() or ReplaceText() dialog ultimately arrives, it contains a far pointer to the original FINDREPLACE data structure in the lParam element of the message packet. The message handler must then inspect the FINDREPLACE.Flags field to determine which event triggered the message:

- The user picked Close from the dialog box's system menu or clicked the Cancel button, and the dialog box is closing.

- The user clicked the Find Next button.
- The user clicked the Replace button.
- The user clicked the Replace All button.

After classifying the message into one of these four major categories, the application can then retrieve additional information from the FINDREPLACE structure and carry out the necessary actions. Bits in the FINDREPLACE.Flags field indicate search-and-replace options selected by the user, such as the direction of the search, case sensitivity, and whole-word versus embedded-string matching, while other fields of the FINDREPLACE structure contain pointers to the search-and-replace strings.

THE DLGDEMO3 PROGRAM

The demonstration program for this column, DLGDEMO3.C, is an expanded version of the DLGDEMO.C and DLGDEMO2.C programs printed in the preceding two issues. Figure 2 contains extracts of the source code that are pertinent to the program's search-and-replace capabilities. You can download the complete source code and executable program from PC MagNet.

The key routines to study in DLGDEMO3.C are InitInstance(), DoMenuFind(), DoMenuReplace(), DoFindReplace(), DoFind(), DoReplace(), and FindString. InitInstance() registers the message used by the common dialog DLL to communicate with DLGDEMO3 by calling RegisterWindowMessage(), and then inserts the message number into the dispatch table called messages[]. DoMenuFind() and DoMenuReplace() are called when the user picks

Find or Replace from the menu bar's Search pop-up menu, and they in turn call the common dialog functions FindText() and ReplaceText(), respectively, to put the

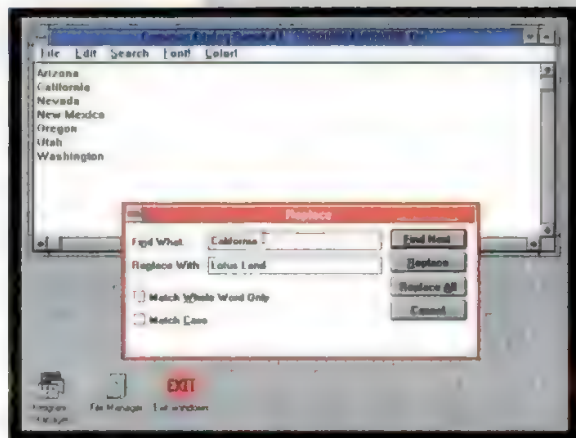


Figure 4: A screen shot of DLGDEMO3, showing the Replace-Text common dialog.

dialog boxes on the screen, as shown in Figures 3 and 4. When a message from either of the modeless dialogs arrives, it is handed off by the main window callback routine, FrameWndProc(), to the procedure DoFindReplace(). This procedure inspects the FINDREPLACE.Flags bits and calls DoFind() or DoReplace() as appropriate.

Having reached this point, we have all the information in hand that we need to carry out the necessary editing. In a real Microsoft Windows-based text editor, this editing might in itself be a very complex endeavor, especially if text files of arbitrary, unlimited size are supported. DLGDEMO3, however, is just a toy program like NotePad that leans on a multiline edit control to manage its text.

Both DoFind() and DoReplace() call the routine FindText() to look for the string specified by the user, and then send messages to the edit control to select and replace the matched text (if any). FindText() is abominably slow in this implementation, since it's based on strcmp() or strcmpi(), but it could easily be improved without requiring any source code changes elsewhere in the program.

THE IN-BOX

Please send your questions, comments, and suggestions to me at any of the following electronic-mail addresses:
PC MagNet: 72241,52
MCI Mail: rduncan
BIX: rduncan

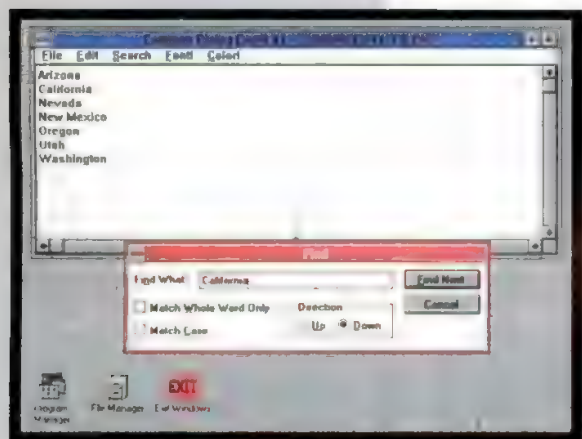


Figure 3: A screen shot of DLGDEMO3, showing the FindText common dialog.

Databases

THE TWO-COLUMN PICK LIST

The two-column pick list is one of the most appealing user interface controls found in event-driven software. Variations of this kind of dialog box are used in several places by *FoxPro* itself, including in its Relational Query By Example. Two-column pick lists let the user select any number of items from a list and place them in any order desired. Menu-driven approaches to accomplishing this are typically clumsy to use.

FoxPro's GET list object provides the foundation necessary for the two-column dialog box, but there are a few twists and turns involved. List objects can be used with data in several forms, among them filenames, field names, arrays, and defined pop-ups. Only defined pop-ups have the MOVER option, which uses double-ended arrows to allow the user to slide items up and down the list to place them in any order desired. In my two-column pick list, the list of available items

■ THE TWO-COLUMN PICK LIST: A user-defined function that presents a two-column pick list in *FoxPro*.

uses an array, but the list of selected items uses a pop-up so the user can re-order the results. This means I have to add to the pop-up dynamically as items are chosen.

To create the pick list routine, you need code or functions that perform the following tasks:

- Add a selection to the Selected list (called in the Available list's VALID clause).
- Remove a selection from the Selected list (called in the Selected list's VALID clause).

■ Move the Selected list items into an array in order to report them back to the calling program (in the CLEANUP section after the READ terminates).

■ Enable or disable controls as necessary, such as when a list becomes empty or when no items are selected (in the SHOW clause of the READ).

The good news is that *FoxPro's* support for passing arrays as parameters and building screen objects that work as functions makes it easy to build a black-box, two-column pick list engine.

The SLIST.PRG routine shown in Figure 1 is just such an engine. To use it, you pass it the names of the two arrays: one containing the list of available items and one for storing the selections. You must pass the arrays by reference (using @) so that SLIST can modify them.

The third parameter is the title for the two-column dialog. Use this parameter to specify a title or leave it out for the default title. When SLIST finishes, it returns the

SLIST.PRG
1 OF 2

```

*****
* SLIST.PRG - Modified version of the output from FoxPro's screen
*   builder
*****
PARAMETER aavail, aselected, ctitle
IF EMPTY(ctitle)
    ctitle="Make Your Selections and Place Them In Any Order"
ENDIF

DEFINE WINDOW wpicklist FROM INT((SCROW()-19)/2),INT((SCOL()-58)/2) ;
TO INT((SCROW()-19)/2)+10,INT((SCOL()-58)/2)+57 TITLE ctitle ;
FLOAT NOCLOSE SHADOW DOUBLE COLOR SCHEME 5

nBarctr = 0          && BAR index counter, never decrements
&& as the popup is relative
nSelected = 0        && counter for the Selected array
navail = ALPH(aavail) && number of items in the Available array
navailpos = 1        && initial/current position of bar in
&& Available list
nSelpos = 0          && initial/current position of bar in
&& Selected list
cOKcancel = ""       && return value of OK and Cancel buttons
DEFINE POPUP pSelected RELATIVE MOVER SCROLL MARGIN MARK ""

ACTIVATE WINDOW wpicklist NOSHOW

@ 8,7 SAY "Available"
@ 8,39 SAY "Selected"

@ 1,1 GET navailpos PICTURE "@N" FROM aavail RANGE 1, navail ;
SIZE 16,22 DEFAULT 1 VALID fnAdd(navailpos) COLOR SCHEME 6

@ 1,33 GET nSelpos PICTURE "@N" POPUP pSelected SIZE 16,22 ;
DEFAULT "" VALID fnRemove(nSelpos) DISABLE COLOR SCHEME 6

@ 11,24 GET cOKcancel PICTURE "@*VT \I\<OK>\?<Cancel>" ;
SIZE 1,8,1 DEFAULT 1

ACTIVATE WINDOW wpicklist
READ CYCLE SHOW slist SHOW()
RELEASE WINDOW wpicklist

* Post-READ Cleanup code
nSelected = 0
IF cOKcancel = "OK"
    * Build Selected array with prompts from the Selected box
    nSelected = CHTEAR('pSelected')
    FOR n = 1 TO nSelected
        * CHTEAR() returns the next bar number, FMBAR() its prompt
        aSelected(n) = FMBAR('pSelected',GETBAR('pSelected',n))
    ENDFOR
ENDIF
RETURN (nSelected)          && Return number of items selected

* FUNCTION Slist_SHOW - Called to enable or disable controls
*
FUNCTION Slist_SHOW
IF nSelected > 0          && If Selected items exist,
    SHOW GET nSelpos ENABLE && enable the Selected listbox
    SHOW GET cOKcancel,1 ENABLE
ELSE
    SHOW GET nSelpos DISABLE && Otherwise disable it
    SHOW GET cOKcancel,1 DISABLE
ENDIF
IF navail > 0            && If Available items exist,
    SHOW GET navailpos ENABLE && enable the Available listbox
ELSE
    SHOW GET navailpos DISABLE && Otherwise disable it
    
```

Figure 1: This *FoxPro* listing shows the SLIST function, a two-column pick list engine that you can include in your programs.

```

ENDIF
RETURN .T.
*
* FUNCTION fnAdd - Add an item to the Selected list
*
FUNCTION fnAdd          ** Add an item to Selected list
PARAMETER nPicked
nSelected = nSelected + 1      ** Update selected array counter
nSelPos = nSelected           ** Set current pos of bar in selected
                                ** to the last item in list
                                ** Relative, it never decrements

nBarctr = nBarctr + 1
* Define a new bar with prompt
* from Available list
DEFINE BAR (nBarctr) OF pSelected PROMPT aavail(nPicked)
IF nPicked = nAvail           ** If item picked is the last one
nAvailPos = nAvail - 1        ** Make (last - one) the current item
ENDIF
=ADDE(aavail, nPicked)        ** Delete current item from Available
nAvail = nAvail - 1           ** Decrement the Available counter
IF nAvail = 0                 ** If there is none left

                                ** put cursor on the OK button.
ENDIF
SHOW GETS                     ** Update screen
RETURN .F.
*
* FUNCTION fnRemove - Remove an item from the Selected list
*
FUNCTION fnRemove        ** Remove item from Selected list
PARAMETER nPicked
nSelected = nSelected - 1      ** Decrement counter
nAvailPos = MAX(nAvailPos, 1)   ** Get current position
nAvail = nAvail + 1             ** Increment it
=ADDE(aavail, nAvailPos)        ** Make space and put it back
aavail(nAvailPos) = PRGBAR('pSelected', GETBAR('pSelected', nPicked))
=ASORT(aavail, 1, nAvail)       ** Sort the array
nSelPos = MIN(nSelPos, nSelected) ** Update the Selected position
RELEASE BAR (GETBAR('pSelected', nPicked)) OF pSelected
SHOW GETS
RETURN .F.

```

number of items selected. This version comes with two buttons: OK and Cancel. Once you grasp the basic concepts, it's easy to add buttons, such as Select All or Remove All, or add features, such as preselecting items.

You must have a patched version of *FoxPro* in order for this routine to work. Versions preceding and including the November 15, 1991, build will not work correctly.

Alan Schwartz
San Francisco, California

SLIST was designed and generated using FoxPro's screen builder, as shown in Figure 2. Since the code generated by the screen builder was too long to print in this column, I modified it for publication by removing unnecessary lines and comments and by joining lines that were separated by semicolons. The original .SCX screen file is available for downloading on PC MagNet.

To use this routine in your program, you first have to create the source array of available items as well as a target array that will hold the user's selections. The target array should be dimensioned to be at least as large as the source array, in case the user selects all of the source items.

Then you call the SLIST function, passing the source and target arrays as parameters and including a suitable title

for display at the top of the dialog. As Mr. Schwartz correctly noted, you must pass the arrays by reference using @ so that SLIST can modify them directly.

For example, to produce the pick list shown in Figure 3, I first created the source array `aAvail` and populated it with snack choices:

```
DIMENSION aAvail(14)
aAvail(1)="Apples"
aAvail(2)="Bananas"
```

Then I created a target array of equal size called `aSelected`, like this:

```
DIMENSION aSelected(LEN(aAvail))
```

Finally, I displayed the pick list using the following call to the SLIST function:

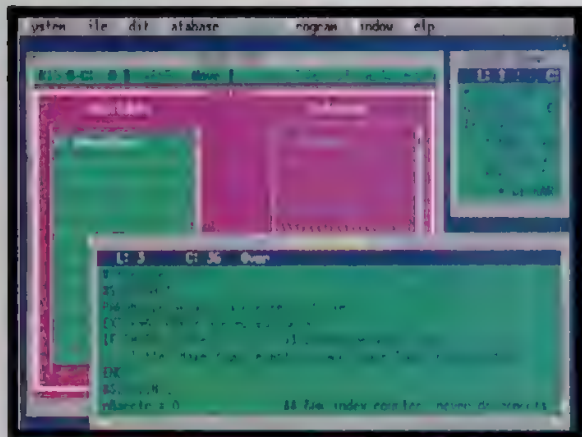


Figure 2: FoxPro's screen builder lets you design dialogs like SLIST by placing interface objects, such as lists and push buttons, in a window and attaching code snippets to them.

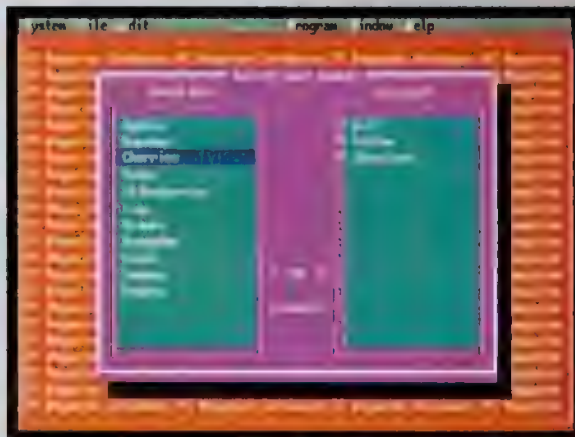


Figure 3: SLIST lets you give the user a two-column pick list for making selections. The selections can be reordered by dragging the double-ended arrows with the mouse.


```
nCount = slist( @aAvail,  
@aSelected,  
* Select some snacks *)
```

On return from SLIST, the variable nCount will contain the number of snacks that have been chosen and the aSelected array will contain the choices themselves. Unused array elements in both aAvail and aSelected are set to a logical false (.F.).

To make a selection, you either press the Enter key, press the Spacebar twice quickly, or double-click on the choice with the mouse. When you choose an item from the source list, it is immediately removed and placed in the selected list, so you can only select an item once. To deselect an item, you simply choose it from the selected list, and back it goes to the available list.

Both the source and target arrays are modified by the SLIST function. If you need to retain a copy of the original source array, you should save it before calling SLIST. You can use *FoxPro's* ACOPY function to do this:

```
ACOPY(aAvail, aOrig)
```

The SLIST function demonstrates one of the neat capabilities that *FoxPro's* extensions to the @...GET command provide—the ability to enable and disable objects. For example, when you choose every one of the available items, the source list box becomes disabled. This is accomplished using the line

```
SHOW GET aAvailpos DISABLE
```

Similarly, the OK button and the list of selected items are enabled *only* after you actually make one or more selections. In this manner, you can use *FoxPro's* SHOW GET command to enable or disable individually any GET as the state of your application changes.

Don't forget, you must have a version of *FoxPro* later than the November 15, 1991, build in order for this function to work correctly. This has to do with when *FoxPro* evaluates the WHEN and VALID clauses for a scrollable list. (Used on an @...GET command, the WHEN clause specifies whether entry into a field is allowed, and the VALID

clause specifies whether exiting a field is allowed.) Usually, *FoxPro* evaluates the WHEN clause each time the cursor is moved within the list and the VALID clause only when a selection is made. However, some earlier builds of *FoxPro* erroneously called the VALID routine when an item was moved within the list using the mouse. This problem has since been fixed.

The original screen file and its generated source code, along with a project file and the source code that produced the display in Figure 3, are available on PC MagNet. Look for SLIST.ZIP in the Databases section of the Utilities/Tips Forum.

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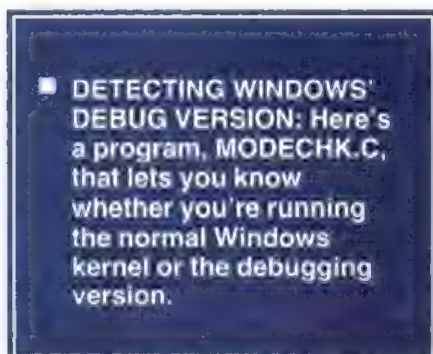
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Languages

DETECTING WINDOWS' DEBUG VERSION

I regularly use the Microsoft Windows Software Development Kit (SDK) to develop Windows software. The SDK includes a debugging version of the Windows kernel, which makes it much easier to find program errors. The kernel is composed of several .EXEs and DLLs, which replace the conventional ones supplied with Windows. And via a couple of batch files, you can switch between the normal and debugging kernels right from the DOS prompt.

Unfortunately, there's no way to distinguish which kernel is loaded while running Windows, so I wrote the program MODECHK (shown in Figure 1) and installed it in the LOAD= section of my WIN.INI file. If the normal Windows kernel is installed, MODECHK simply



terminates. However, if you run the MODECHK program under the debugging kernel, it displays an icon at the bottom of the screen to remind you which version you're using.

Dion Shea
Dollard des Ormeaux, Quebec
Canada



It's not easy to distinguish the debugging version of Windows from the standard one. The Program Manager's About box does identify the debugging version, but that's not always convenient, so MODECHK is a good idea.

The original version of MODECHK got the job done, but it could have been simpler and more efficient. As initially written, it actually displays a window and then minimizes it to an icon. Consequently, you see a sudden flash on the screen—even if the debugging kernel is detected.

I modified MODECHK, simplified it, and cut out some unnecessary code and data. Then I moved the debugging detection to the beginning of WinMain; after all, if the program is going to terminate when the normal kernel is detected, it

MODECHK.C	COMPLETE LISTING
<pre>// modechk.c #include<windows.h> int PASCAL WinMain(HINSTANCE, HINSTANCE, LPSTR, int); long FAR PASCAL WndProc(HWND, unsigned int, WORD, long); char *szWinDebug = "WinDebug"; int PASCAL WinMain(HINSTANCE hInstance, HINSTANCE hPrevInstance, LPSTR lpCmdLine, int nCmdShow) { HWND hWndMain; // window handle MSG msg; if(!GetSystemMetrics(SM_DEBUG)) // if not DEBUG mode return FALSE; // get outta Dodge if(!hPrevInstance) /* If this is the first instance, register */ /* the class */ { WNDCLASS wc; /* Structure for registering */ /* window class */ wc.style = 0; wc.lpfnWndProc = WndProc; wc.cbClsExtra = 0; wc.cbWndExtra = 0; wc.hInstance = hInstance; wc.hIcon = LoadIcon(hInstance, "ModeIcon"); wc.hbrBackground = NULL; wc.lpszClassName = szWinDebug; wc.hCursor = LoadCursor(NULL, IDC_ARROW); wc.lpszMenuName = NULL; if(!RegisterClass(&wc)) return FALSE; } hWndMain = CreateWindow(szWinDebug, szWinDebug, WS_CAPTION WS_SYSCOMMAND WS_ICEMIC, CW_USEDEFAULT, CW_USEDEFAULT, CW_USEDEFAULT, CW_USEDEFAULT, NULL, NULL, hInstance, NULL);</pre>	<pre>if(!hWndMain) return FALSE; ShowWindow(hWndMain, SW_SHOWMINIMIZED); // display as an icon UpdateWindow(hWndMain); while(GetMessage(&msg, NULL, NULL, NULL)) // std message loop { TranslateMessage(&msg); DispatchMessage(&msg); } return msg.wParam; } long FAR PASCAL WndProc(HWND hWnd, unsigned int message, WORD wParam, long lParam) { switch (message) { case WM_CREATE: // when window is created, { // remove unneeded System items HMENU hSysMenu = GetSystemMenu(hWnd, 0); RemoveMenu(hSysMenu, SC_RESTORE, MF_BYCOMMAND); RemoveMenu(hSysMenu, SC_MOVE, MF_BYCOMMAND); RemoveMenu(hSysMenu, SC_SIZE, MF_BYCOMMAND); RemoveMenu(hSysMenu, SC_MAXIMIZE, MF_BYCOMMAND); break; } case WM_CLOSE: { DestroyWindow(hWnd); break; } case WM_DESTROY: { PostQuitMessage(0); break; } default: { return DefWindowProc(hWnd, message, wParam, lParam); } } return 0; }</pre>

Figure 1: Use this program to determine whether you're running the debugging version of the Windows kernel.

might as well do so early in the process. Detecting the debugging kernel is easy: Just pass the SM_DEBUG identifier to the Windows API function, GetSystemMetrics, and it will return TRUE if the debugging kernel is present. For example, consider the following:

```
if(!GetSystemMetrics(SM_DEBUG))
    return FALSE;
```

When you put this immediately inside WinMain, the program terminates without creating a window if it detects the normal kernel.

I also modified the class registration and window creation code of the original program. I changed the initialization of the hbrBackground, hCursor, and style members of WNDCLASS to NULL. Since the program is iconic, it doesn't need to load a brush or a cursor, nor does it need to use any class style bits. And I changed which window styles were passed to CreateWindow. You can use the WS_ICONIC style bit to ensure that MODECHK is going to be minimized from the start, and you don't need the standard WS_OVERLAPPED window style; instead, you can simply include WS_CAPTION and WS_SYSMENU so the program will have an icon title and a system menu.

To get the window to display, all you need is a ShowWindow call in WinMain:

```
ShowWindow(WndMain,
    SW_SHOWDEFAULT);
```

And since there is no main window, there's no need to include the Restore, Minimize, Maximize, or Size options on the System menu. So I removed them by placing the following code in the WM_CREATE processing code of MODECHK's window procedure:

```
case WM_CREATE:
    GetSystemMenu(hwnd, 0);
    RemoveMenu(hSystemMenu, SC_RESTORE,
        MF_BYCOMMAND);
    RemoveMenu(hSystemMenu, SC_MINIMIZE,
        MF_BYCOMMAND);
    RemoveMenu(hSystemMenu, SC_MAXIMIZE,
        MF_BYCOMMAND);
    RemoveMenu(hSystemMenu, SC_SIZE,
        MF_BYCOMMAND);
```

Finally, I touched up the program's icon. Since that's all of the program we get to

see, it should be prominent. So I changed the icon from a letter D and a bug to a large D with a bug inside it.

With these changes, MODECHK not only is a useful program to detect the debugging kernel, but it also illustrates how to produce a program that starts out and remains minimized.

—Richard Hale Shaw

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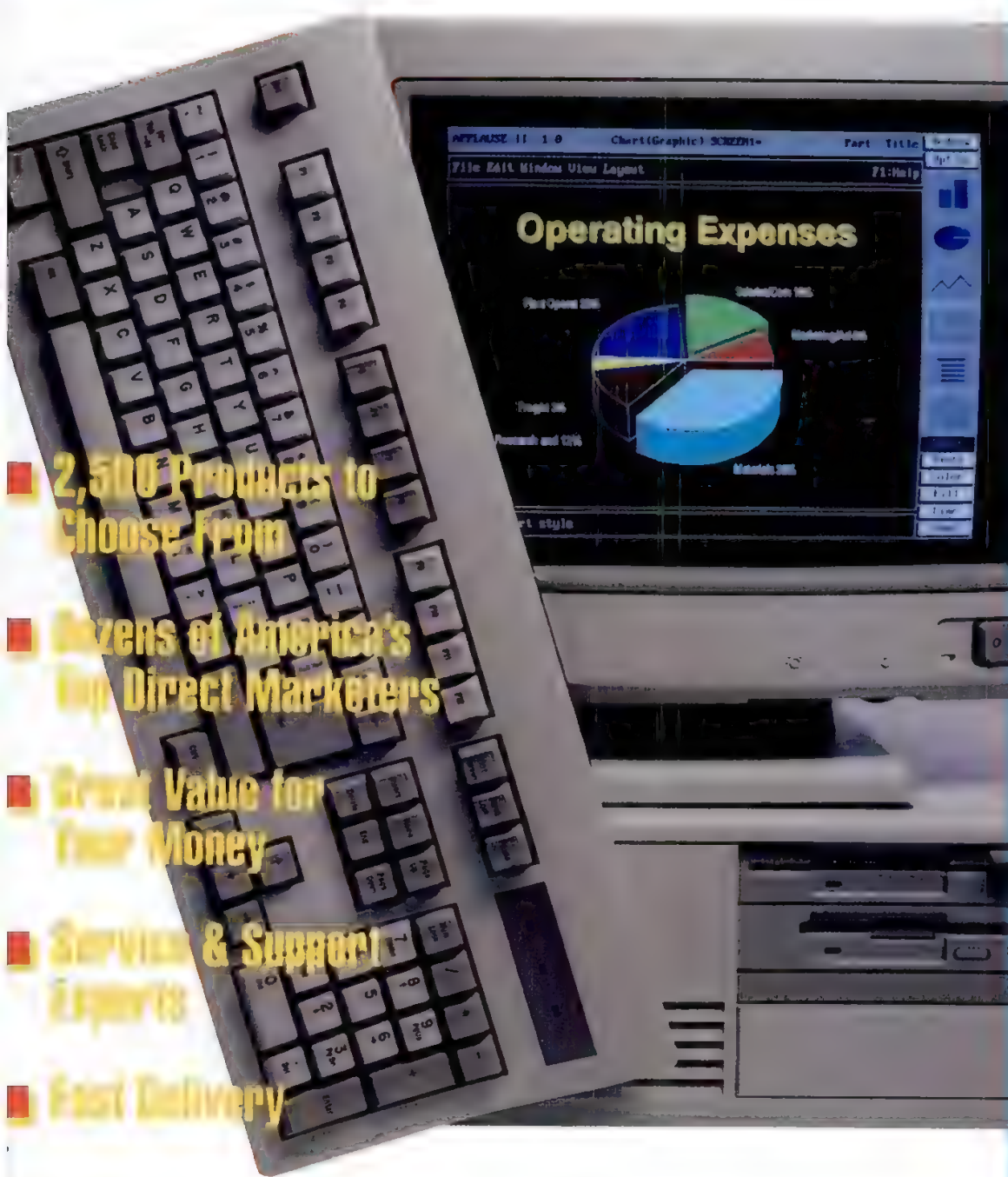
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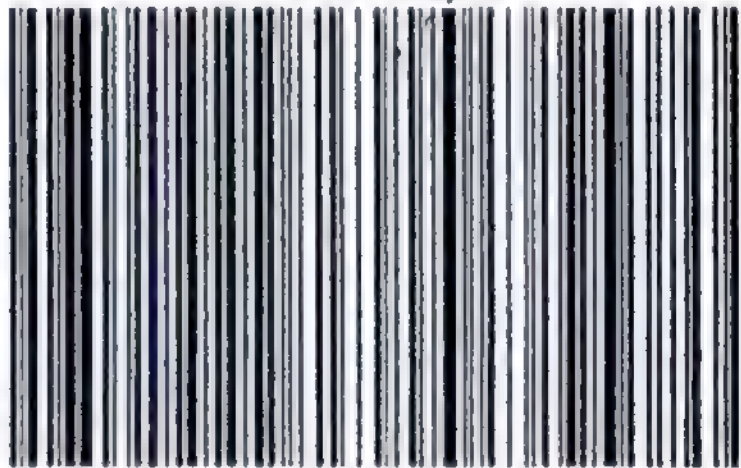
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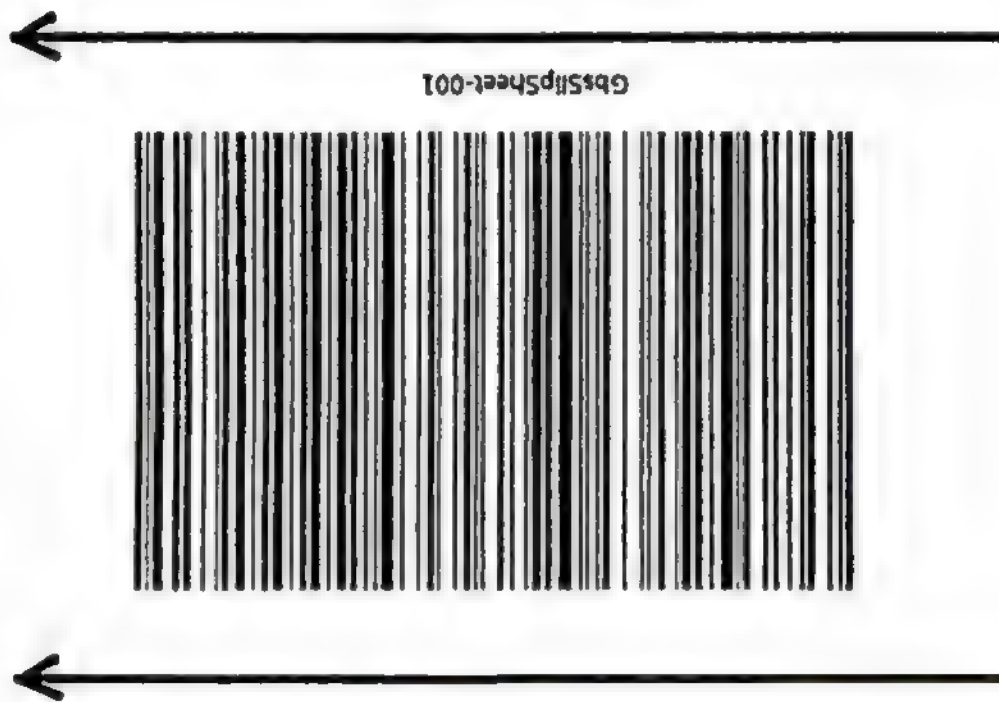
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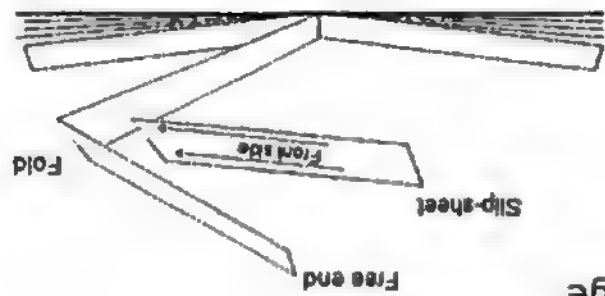
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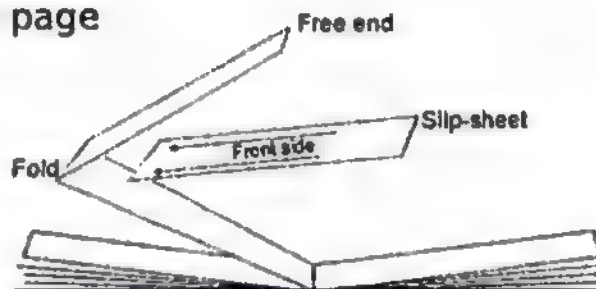
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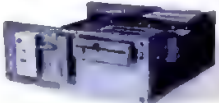


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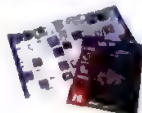
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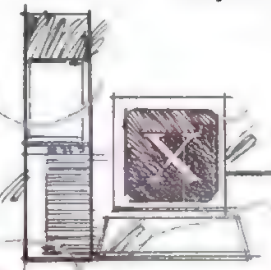


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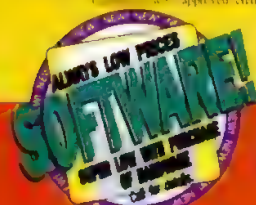
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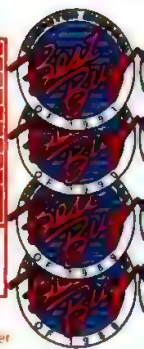
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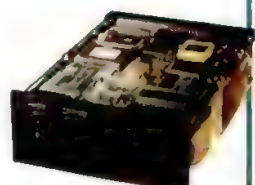
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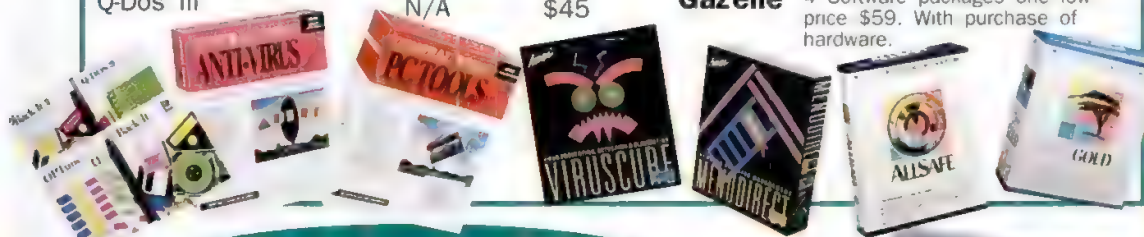
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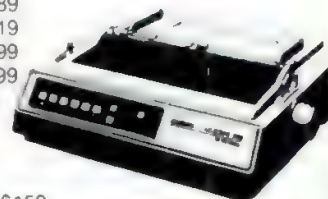
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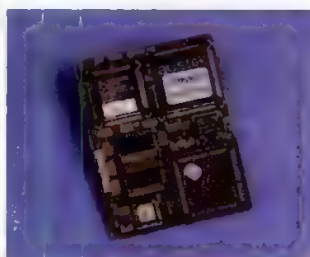


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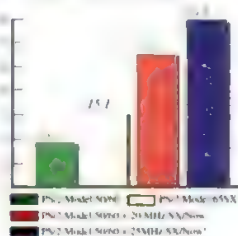
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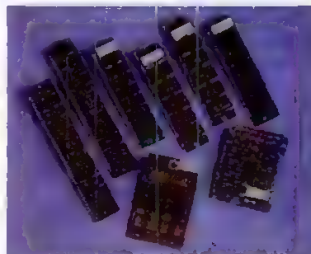
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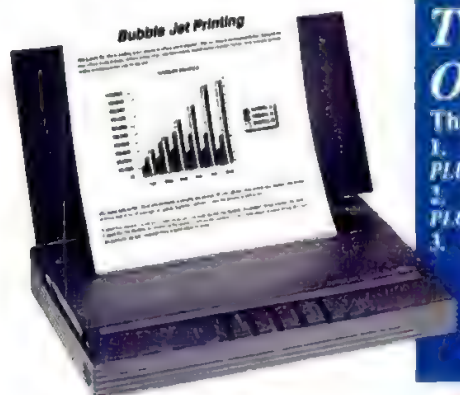
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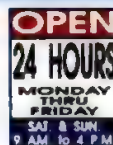


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486/50L	32Meg Module	116568-001	1900.00
System Pro			
DeskPro 386/25, 386/20	1Meg Module	113131-001	69.00
	4Meg Module	113132-001	189.00
DeskPro 386S-16MHz	1Meg Exp Bd	113633-001	110.00
	4Meg Exp Bd	113634-001	239.00
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DeskPro 386/20E	1Meg Exp Bd	113644-001	119.00
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T2000SX/2200SX	8Meg	PC PA2002U	399.00
T4400SX	2Meg	PC PA2003U	209.00
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T4400SX	8Meg	PC PA2005U	649.00
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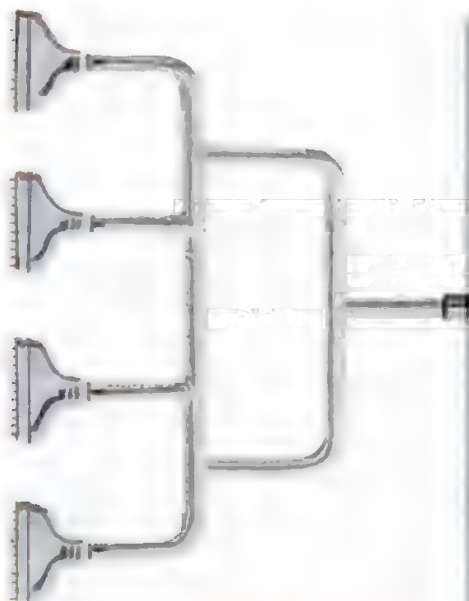
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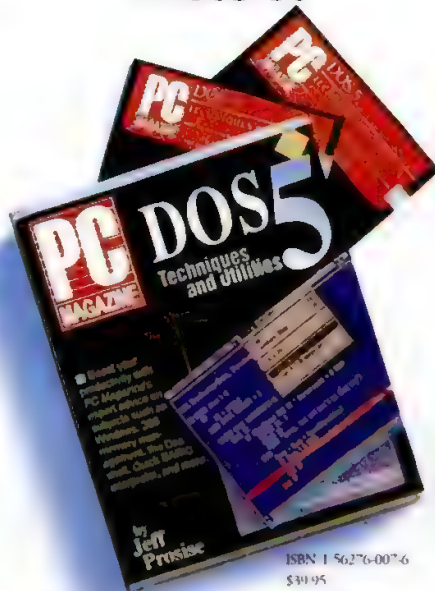


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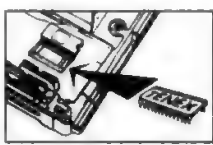
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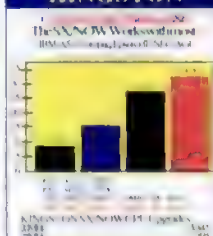
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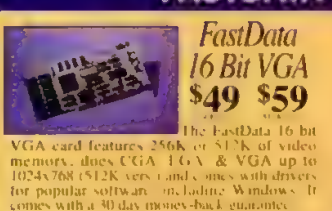
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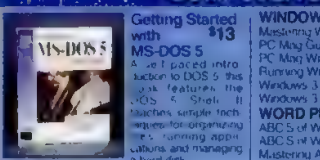
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Books ideal for beginning users	
Running Excel	\$21
Learn with Excel: plan, analyze, and authorize the steps, this book includes step-by-step instructions, tables and formulas, and a glossary of terms.	

DATABASE & FORMS

askSam 5.0	209
Clarion Personal Developer	45
Clarion Professional Developer 3.0	449
Clipper 5.01	489
DataEase	509
dBase III+	419
dBase IV 1.5	449
dBXL Diamond	129
FormTool Gold	52
Formfiller	79
Foxbase Plus	179
FoxPro 2.0	449
Paradox 3.5	469
Paradox Competitive Upgrade	165
Paradox SE	65
Per:Form Designer & Filler	89
Personal Rbase	69
Q & A 4.0	249
RapidFile	189
Rbase for DOS	447
Reflex	159

ENTERTAINMENT

AutoMap \$49

Whether you planning the quickest, shortest or most scenic route, AutoMap can layout the desired course of travel. This colorful road atlas for PCs has simple to read map displays and easy to follow instructions. Forest lumblime with fold out maps - just tell AutoMap where you're starting from and where you want to go.



AutoMap U.S.A./Europe	39/99
BodyWorks/Orbits	39/29
Carmen SanDiego Deluxe Edition	45
F-19 Stealth Fighter	38
Falcon 3.0	45
King's Quest 5 (VGA Vers.)	38
Leisure Suit Larry V	39
Microsoft Flight Simulator	38
Aircraft & Scenery Designer	27
PC Globe or PC USA	35
Simcity or Simcity for Windows	28
SimEarth	39
Wing Commander I / II	39/45

DESKTOP PUBLISHING

Adobe Postscript Cart. for HPLJ-II	239
Bannermania	21
Express Publisher	Call
Microsoft Publisher for Windows	129
Pagemaker 4.0	489
PFS First Publisher	89
Printshop	33
Publisher's Paintbrush	279
Publish It!	129
Ventura Publisher Gold / Windows	499

FINANCIAL

ACCPAC BPI Value Pak	359
ACCPAC Simply Accounting DOS	119
DAC Accounting 4.2	85
DAC Bonus Pack 4.2	119
DAC Accounting Upgrade	45
Managing Your Money	125
Microsoft Money for Windows	45
Money Matters	29
One Write Plus G/L, A/P & A/R	79
Pacioli 2000	29
Peachtree Basic Acctg	69
Peachtree Acctg. for Windows	69
Peachtree Complete III	139
Peachtree with Data Query	209
Quicken DOS / Windows	41/41
The Manager's Organizer	139
Timeslips III	179
TurboTax DOS / Windows	45/59
Wealth Builder	89

DacEasy \$47

Accounting Upgrade
Upgrade or switch from your older DacEasy version to other accounting software or even your spreadsheet if you use it for accounting. The new DacEasy 4.0 includes General Ledger, A/P, Cash Management, A/R & Billing, Inventory, Purchase Order and Budgeting modules. Dac is truly easy to use, with context-sensitive and indexed help, mouse support, and pull-down menus. It even includes a report generator & built-in graphics.



WINDOWS SOFTWARE

1-2-3 for Windows 1.1	379
1-2-3 for Windows Comp. Upgrade	99
3-D Charts to Go for Windows	55
ACCPAC Simply Acctg for Windows	119
Adobe Illustrator 4.0	359
Adobe Type Sets	Call
Adobe Type Align	59
Adobe Type Manager	59
Adobe Type Manager Plus Pack	115
After Dark for Windows	25
Ami Pro 2.0	279
Ami Pro 2.0 Competitive Upgrade	99



Microsoft Office \$447

This special bundle includes the leading Windows applications, Excel, Word and PowerPoint all in one. Excel is the top rated graphical spreadsheet. Word is the #1 selling Windows word processor. PowerPoint is the top presentation package. Act now and you will save half the cost if purchased separately.

Asymetrix Toolbook	279
BeckerTools	37
BitStream MakeUp	89
Corel Draw!	349
Correct Grammar	57
DBlast! Windows	319
Direct Access Windows	60
Excel 4.0	299
Excel 4.0 Comp./Vers. Upgrade	119/95
FormWorks	139
Freehand	Call
Grammatik IV for Windows	55
Hollywood	299

Windows 3.1 Upgrade \$45

New Microsoft Windows 3.1 is the upgrade of the year. Faster, easier, safer and more powerful. Microsoft has made 100 of improvements to benefit advanced users and novices alike. It includes new TrueType® scalable fonts and new MultiMedia features. It includes an improved File Manager, faster and more efficient memory use, Express Install, improved printing speed, new built-in tutorial, special enhancements for laptop users and a whole lot more. To upgrade you must have an older Windows version.

Instant Orgchart!	119
JustWrite	75
Micrografix Designer	449
MicroPhone II	89



After Dark 2.0 \$25

After Dark is the most advanced screen saver for Windows. Choose from over 40 savers, including the famous Flying Toasters. You can also password protect entry to Windows with Windows Shutter. SystemQ! monitors activity and maximizes performance while running After Dark. Also includes digital sound and DOS blanking.

Microsoft Ent. Pack I, II or III	27
Microsoft Mouse w/ Windows 3.1	147
Microsoft Office Word/Excel/Powerpoint	447
Microsoft PowerPoint for Windows	309
Microsoft Productivity Pack	39
Microsoft Project for Windows	429
Microsoft TrueType Font Pack	55
Microsoft Windows 3.1	89
Microsoft Windows Developer's Kit	309
Microsoft Word for Windows	299
M Y O B	129
Norton Backup	85
Norton Desktop	89
On Target	239
PackRat 4.0	239



MS Works for Windows \$129

New Microsoft Works for Windows is the easy to use integrated software for Windows that's designed with small business users in mind. It includes a Word processor with Speller and Thesaurus, Spreadsheet with charting, Database with report generator, and Drawing tool to design graphics you can paste into your word processing document. On-line help is a click away and Work Wizards guides you through the process of creating custom documents.

Pagemaker	489
Persuasion	319
Per Form Pro	179
PFS WindowWorks	109
Pro Write Plus	159
Publisher's Powerpak	45
Publisher's Paintbrush	279
Quicken for Windows	41
Quattro Pro for Windows	Call
RightWriter for Windows	55
Turbo Pascal for Windows	119
Ventura Publisher	499
WideAngle for Windows	75
Winconnect	59
Windows Draw	95
WinFax Pro	69
WordPerfect for Windows	249



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Autosketch 3.0	139
Corel Draw 2.0	349
Design CADD 3-D	185
DrawPerfect	259
Freelance Graphics 4.0	299
Freelance Competitive Upgrade	89
Generic 3D Drafting	199
Generic Cadd Level 2 Starter Kit	85
Generic Cadd 6.0	279
Harvard Graphics DOS/Windows	Call
PC Paintbrush IV Plus	109

Adobe \$359 Illustrator 4.0

Illustrator 4.0 for Windows brings unprecedented design & illustration power to the PC. It includes preview mode, editing, 21 font outline support, and incredible text handling features. Ideal for the most advanced desktop publishers. Adobe Illustrator for Windows includes Adobe Separator and Adobe Type Manager with 40 fonts.



INTEGRATED

First Choice	95
Framework XE	95
Geoworks Pro	115
LotusWorks	89
SmartWare II	417
Symphony 2.2	489
Works	89
Works w/ MS Serial Mouse	149

PROGRAMMING

Borland C++	289
Borland ObjectVision for Windows	91
Macro Assembler	35
Microsoft C Compiler	29
Quick Basic or Quick Pascal	60
Quick C DOS/Windows	129
Turbo Pascal Dos/Windows	99/119
Visual Basic for Windows	125
Windows Developer's Kit	309

SPREADSHEETS

Allways	115
Excel 4.0 for Windows	299
Excel 4.0 Comp./Vers. Upgrade	119/95
Lotus 1-2-3 version 2.4	325
Lotus 1-2-3 version 3.1+	399

1-2-3 for Windows \$379

Lotus 1-2-3 for Windows is everything a Windows spreadsheet was meant to be. Which means it's simple, flexible, graphical, and uniquely powerful. Includes SmartIcons, one click shortcuts for your most frequently used formulas, 31 outlines and integrated graphics, data & text. Make your work just better! You can upgrade from your present spreadsheet through FastMicro for just \$89.



Quattro Pro 4.0	299
Quattro Pro 3.0 Comp. Upgrade	Call
Quattro Pro 3.0 SE	45
Supercalc 5.2	89

WORD PROCESSORS

Facelift for WordPerfect	57
Grammatik V	55
LetterPerfect	119
Multimate 4.0	239
Professional Write	159
Publisher's PowerPak / WordPerfect	45

WordPerfect for Windows \$249

The #1 Word Processor comes to Windows! WordPerfect 5.1 for Windows is simple, powerful, and fun to use. WPWin includes constant-time format & automatic document updates, and full graphical on-line help. Upgrade from WP for DOS for \$75 or other word processor for just \$115!

Rightwriter DOS/Windows	55/55
Word	209
WordPerfect 5.1	249
WordPerfect for Windows	249
WordPerfect for Windows Upgrade	115
WordPerfect Add'l Station License	159
WordPerfect Office	89
WordStar Pro/Windows	259/259
Writer's Toolkit	79

UTILITIES

386 MAX	59
Address Book Plus	47
Calendar Creator Plus	53
Carbon Copy Plus	107
Central Point Backup	75
Checkit	79
Company Ladder	45



MS-DOS 5.0 Upgrade \$55

Microsoft DOS 5.0 frees 15K of space for DOS on 286 & 386 PCs. It includes a new Shell, Un delete and Unformat new files and more. Also includes Online Central Line Help, Backup and Windows enhancements. Plus you can install it on your drive without interrupting even on Networks. This official upgrade pack requires that you simply have an older command.com on your drive!

Control Room	79
CoreFast	Call
Desqview 2.4	75
Desqview 386 2.4/6.0	125
Direct Access	57
Disk Manager Dos / Novell	36/119
Disk Optimizer	29
DR DOS 6.0	65
Fastback Plus	109
GoScript 4.0	89
Hijack	125
InfoSpotter	45
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Norton Backup	85
Norton Utilities	109
PC Anywhere IV	109
PC Tools Deluxe 7.1	99
Personal Lawyer	15

Close-Up 4.0 Dual Pack \$119

Winner of PC Magazine Editor's Choice & PC World's Best Buy, Close-Up is the ideal way to run another PC remotely via modem. It runs remote DOS and Windows applications with the latest remote screens and file transfers over Special Dual Pack includes host & remote.



P D. Queue	55
Pop Drop Plus	53
PrintRite	19
ProComm Plus	65
Prodigy	25
QA Plus	85
QEMM 386 6.0	57
QRAM 2.0	49
SideKick 2.0	59
Sideways	55
Smartcom Exec	69
SpinRite II	69
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Stacker XT8 / AT16	149/179
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Adobe Streamline Windows.....	120	MS PowerPoint for Windows.....	293
Adobe Type Manager Windows.....	59	MS Productivity Pack.....	36
After Dark.....	27	MS Project for Windows.....	412
Am Pro 2.0.....	275	MS Publisher for Windows.....	118
Becker Tools.....	70	MS Word for Windows.....	293
Borland C++.....	269	MS Works for Windows.....	118
Carbon Copy for Windows.....	111	Norton Desktop.....	93
Corel Draw 2.0.....	359	Objectvision.....	94
Crosstalk for Windows.....	115	Omni Page 386.....	436
dBFast.....	325	On Time for Windows.....	70
Designer.....	446	PC-Kwik Power Pak.....	69
Drafax Cadd Windows.....	410	Packrat v4.0 for Windows.....	235
Facelift for Windows.....	59	PageMaker 4.0.....	499
Facelift for Windows ValuePak.....	117	PerFORM Pro.....	178
Formbase for Windows.....	295	PS Professional Write Plus.....	158
Grammatik V Windows.....	55	RightWriter for Windows.....	53
Harvard Graphics for Windows.....	339	Superbase 4.....	451
hDC File Apps.....	70	Toolbook.....	280
hDC FirstApps for Windows.....	53	Turbo C++ Windows.....	33
hDC ICON Designer.....	32	Ventura Publisher Gold/Windows.....	499
hDC Windows Express.....	53	WinConnect.....	59
IBM Current.....	213	WINFAX Pro.....	70
Lotus 1-2-3 for Windows.....	396	Wingspeed.....	95
MathType Windows.....	155	WinTools.....	119
MS Entertainment I, II, III.....	25	WordPerfect for Windows.....	258
MS Excel for Windows.....	293	Wordscan + 286/386.....	647

OFFICE ON THE GO



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Appoint.....	AST.....
Thumbelina Portable.....	Exec 386SX-20 40Mb.....
Battery Watch Pro.....	Everex.....
Brooklyn Bridge w/Par & Ser Cable.....	Tempo LX 386SX-20 1/20 Mb.....
LegLink Pro.....	NeoStar.....
Leading Edge LT386.....	386SX 2/40 Mb Notebook.....
Logitech Mouseman Serial Cordless.....	386SX-20 2/40 Mb Notebook.....
Microsoft BallPoint Mouse.....	Panasonic.....
MicroSpeed MicroTrac.....	All Models.....
VGA Dimmer.....	2000 20Mb.....
Winconnect.....	3000 60Mb.....
Toshiba.....	3000 WINSX 60Mb.....
TS2000.....	Other Models.....
TS2000.....	Call
Others.....	Call

CD ROM/MULTIMEDIA



HARDWARE	SMART & FRIENDLY
NEC.....	CD ROM Bundle.....
CD ROM INT CDR-36 XT/AT w/int.....	Sony CD-535 Drive, Interface, Cable, Disk Caddy & Audio Play Software.....
CD ROM EXT CDR-73 M w/int.....	*Special Software Bundle Prices.....
CD ROM INT CDR-83 M w/int.....	Internal.....
COREL Blockbuster Bundle Int.....	External.....
Panasonic Worm 940 MB.....	Call/Call
Sony.....	
CD ROM INT.....	
CD ROM EXT.....	
SOUND CARDS	
Creative Labs.....	
Sound Blaster.....	
Sound Blaster Pro.....	
Ad Lib Music Synthesizer Card.....	
SOFTWARE	
Atlas Pak.....	
Mammals.....	
NEC Type Gallery PS.....	

NETWORKING & LAN



SOFTWARE	HARDWARE
ACCPAC BPI LAN.....	Eagle.....
Dac Easy Network Acct.....	NE2 Netw LT Combo Add on (3.5).....
Data Ease Access Server 3-Pak.....	Netw are LT Combo Add on (3.5).....
Direct Access Network Unlimited.....	Netw are LT Combo Add on (5.25).....
FoxPro Dist Kit.....	Netw LT Cmbo NE/2000 Strt (3.5).....
FoxPro Lan 2.0 - 6 Pak.....	Netw LT Cmbo NE/2000 Strt (5.25).....
Lotus 123 3.1+ Network.....	Artisoft.....
MS Excel License Pack.....	Lantastic 2MBPS Starter.....
Netroom Single (dual).....	Lantastic Ethernet Starter.....
Norton PC Anywhere LAN.....	Others.....
Novell NetWare Lite.....	Standard Microsystems.....
Novell NetWare 386 16 PK.....	Ethercard Plus 8 bit Elite.....
Peachtree Network.....	All Other Models.....
Print Q LAN (4 User).....	Tieria.....
Procom + LAN - 5 Pak.....	All Other Models.....
Q & A Network Pack.....	
Quattro Pro Lan.....	

CAD & ENGINEERING



Auto Sketch 3.0.....	Summsketch 12x18 Pro II.....
Design CAD 3-D.....	4 or 16 Button.....
Generic CAD 6.0.....	Turbo Cadd.....
Generic CAD Starter Kit Level II.....	CalComp.....
Math CAD.....	33120-34 Dig12x12 16B.....
Summsketch 12x12 II 4 or 16 Butn.....	33120-34 Dig12x12 4B.....

KEYBOARDS

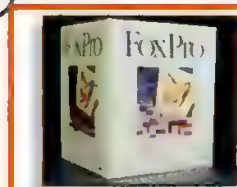
Keytronics KB101Plus.....

TAPE BACKUP

Colorado Memory System.....
Jumbo 120/250 INT.....
Jumbo 60/120 INT.....

POINTING DEVICES

Logitech Mouseman Serial/PS2.....
Logitech Trackman Portable.....
MS Ballpoint Mouse.....
MS Bus or Serial w/Windows 3.1.....
Microspeed PC Trac Ser or PS/2.....



FOXPRO 2.0 6-PACK

FoxPro 2.0 delivers the next generation in database management for today's DOS systems. Intuitive, mouse-driven interface and 4GL tools make common data management tasks fast and easy. New RQBE tool simplifies complex queries, while Rushmore performs them faster than a mainframe.

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Logitech.....
Logi Scanman 256 for PS/2.....
Logi Scanman 256.....

SOFTWARE.....
Catch Word for OCR.....
CAT Reader Pro 1/2 Page.....
OmniPage 386 Windows.....
OmniProfessional 2.0.....

TERMINALS

Wyse.....
30+.....
150.....
160.....
185.....

BOARDS

ATI.....
VGA Wonder XL 256K.....
VGA Wonder XL 512K.....
Diamond.....
Speed Star H-Color.....
Speed Star Plus VGA.....
Stealth 1Mb w/H-Color.....
Everex.....
RAM 3000 Deluxe.....
RAM 8000.....
Hercules All Models.....
Intel.....
Above Board + 512K Plus.....
Above Board + w/2MG P/S.....
Above Board + w/2MG.....
Expands to 8 MG.....
Inboard 386 PC (1MG).....
Other Models.....
Orchid.....
Tiny Turbo 286.....
Tiny Turbo Xtra.....
Other Models.....
Paradise.....
VGA + 256K.....
VGA 1024 512K.....
Video 7.....
1024 i w/256K.....
Other Models.....



386MAX V6.0 FROM QUALITAS

Winner of the 1991 BYTE Award of Merit, PC Magazine's Editors Choice award, and InfoWorld's Top Scoring Memory Manager, 386MAX 6.0 enhances Windows and supercharges DOS 5.0.

\$52

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Plus Development.....
11 XL50 MB.....
N XL100 MB.....
Other Models.....

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Sony.....
3.5 D/S D/D (100).....
3.5 H/D (100).....
5.25 D/S D/D Disks (100).....
5.25 High Density (100).....

CO-PROCESSORS

Cyrix.....
80387-DX 25.....
80387-DX 33.....
80387 SX-16.....
Intel.....
80387-DX 33.....
80387 SX-16.....
80387 SX-20.....
Others.....

FCM62852



BITFAX FOR WINDOWS

BitFax for Windows is a full featured easy to use send/receive fax software program. Build a fax from several different Windows programs and send it with a mouse click. Receive faxes in the background. Schedule broadcast faxes at off peak hours, export fax images, and view and print faxes.

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CA-Textor offers an easy-to-use, feature-rich user interface that incorporates select features, such as pull-down menus, pop-up dialogs and a user-configurable tool bar, which gives you simple and direct access to the many powerful features of CA-Textor.

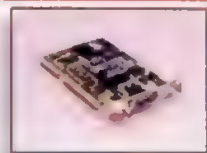
\$132

MONITORS

Aamazing	
12" MM 1288	\$72
14" CM 8484 EX	308
Andak All Models	Call
Arche	
14" VGA Paper White	113
14" SVGA 28 1024 X 768 Non-Intid 339	
Mitsubishi	
XC 1410 CEGA	229
XC 1425 C VGA	376
Other Models	Call
NEC	
Multisync 2A	384
Multisync 3FGX 14"	658
Multisync 4FG 15"	782
Multisync 5D 21"	1573
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486-33/128C, 4MB, 210MB, Win 3.0 & Logi Mouse, Non-Interid SVGA	2299

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AutoMap	\$47
Bodyworks	39
Knowledge Adventure	49
Math Blaster Mystery	28
MS Learning PC DOS	39
Orbits	29
PC Globe, PC USA	Call

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Action Laser II	\$713
Hewlett Packard	
Desk Jet 500C	745
Laser Jet IIP	848
Laser Jet III	1565
Laser Jet III P	1882
IBM LaserPrinter 50pm	1089
NEC Silentwriter II Model 95	1441
Okidata	
OL-400 Par	618
OL-610	Call
OL-630	1304
OL-840	1606
Texas Instruments	
Micro Laser	834

DOT MATRIX

Citizen Printer	
200GX-15	\$297
GSX 140 +	296
Other Models	Call
Epson	
LQ570	271
LX810	162
Other Models	Call
NEC All Models	Call
Okidata	
1841 IBM	222
321 ML Par	433
PaceMark 3410	1261
Other Models	Call
Panasonic	
1122	285
1124	292
1110	375
New 2000 Series	Call
2624	367
Other Models	Call
Star Micronics	
NX 1001	140
NX 1020 Rainbow	184
Other Models	Call

OTHER

Canon BJ-10EX	\$325
Seiko Smart Label + Printer	128

COMMUNICATION HARDWARE

ATI	
2400 ETC INT w/SW	\$105
2400 ETC EXT	129
Cardinal All Models	Call
Complete	
Communicator	289
Other Models	Call
Everax	
Evercom 12 INT	46
Everfax24/36 INT	246
Other Models	Call
Hayes	
2400 B	218
Other Models	Call
Intel	
2400 B Classic	135
2400 EXT	167
Practical Peripheral	Call
All Models	Call
Prometheus	
2400 B w/Software	54
Pro Modem 9600 + EXT	672
U.S. Robotics	
All Models	Call
Zoom	
2400 EXT V.42 Bis	113
2400 EXT w/4800 fax	65
2400 EXT w/9600 fax	70
2400 INT w/9600 Send/Rec	103
Other Models	Call

DISK DRIVES

Conner	
All Models	Call
Imagex (Bernoulli)	
Beta 44 MG Transportable	850
Beta 44 MG Insider	755
Other Models	Call
Maxtor	
7080A 80MG IDE	275
LXT 213A 200MG IDE	608
Micropolis	
All Models	Call
Seagate	
ST3144A 130 Mb	380
ST3206A 83MB	284
Other Models	Call
Teac	
3.5" 1.44 MB AT	79
5.25" 1.2 MG AT	69
Toshiba 3.5 1.4 MG	56

FORM PROCESSING

Formtek Gold 3.0	\$53
PerFORM 2.1	88
Lotus 1-2-3 Ver. 2.3	\$325
Lotus 1-2-3 Ver. 3.1 +	399
Plan Perfect 5.1	225

ELECTRONIC MAIL

CC Mail	
Platform Pak (Windows)	\$309
Platform Pak (DOS)	123
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25-User Expandable	372
Gateway	917
Remote	150
WordPerfect Office v3.1	62
WordPerfect Office LAN 5 Pack	281
WordPerfect Office LIC 20 Pack	848

OPERATING ENVIRONMENTS

Dr DOS v6.0	\$64
MS DOS 5.0 Upgrade	49
MS DOS 5.0 OEM	49
MS DOS 5.0 (MS Full)	69
MS Windows Ver. 3.1	59

PROFESSIONAL DESKTOP PUBLISHING

Freedom of Press DOS or Windows	\$235
Pagemaker 4.0	489
Ventura Pub Gold/GEM	516

PRESENTATION GRAPHICS

Corel Draw 2.0	\$359
Oradix Ultra v4.0	234
DrawPerfect	279
Harvard Graphics 3.0	389
Lotus Freelance Graphics 4.0 Upgrd	93

DATA BASE MANAGEMENT

Claron	
Personal Developer	\$42
Professional Developer	444
Copper	498
Data Perfect	269
Phase IV	489
FoxPro API Library Construction	310
FoxPro Dist Kit	285
FoxPro Single User 2.0	449
Infoselect	87
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QMA	250
R & R Relational Report Writer	163



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Norton Utilities 6.01	\$109
PC Tools 7.1	96
QDOS III	41
SpinRite II	59
Stacker v2.0	178
XTRace Gold 2.5	92

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386MAX 6.0	\$52
Desquivex 386	128
Demm 386	57

MENUING SOFTWARE

Power Menu Plus	\$61
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PRINT

Pirezz Plus	\$85
Print Q v5.0	79
Sideways v3.1	54

SCREEN SAVERS

After Dark	\$27
Intermission	27

WORD PROCESSORS

Grammit V (DOS)	\$55
LetterPerfect	84
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PFS ProWrite Plus	158
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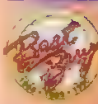
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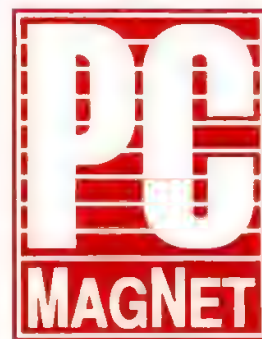
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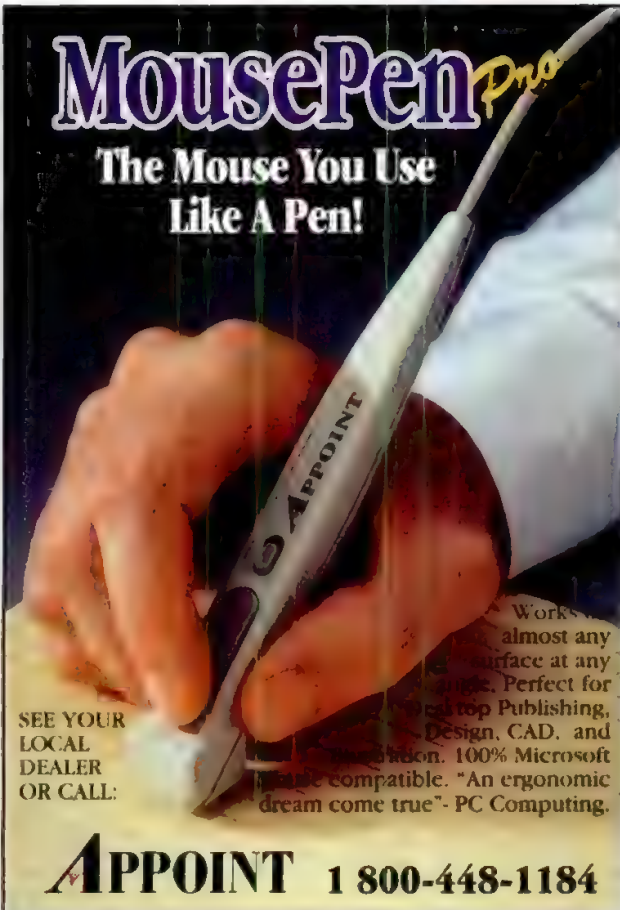
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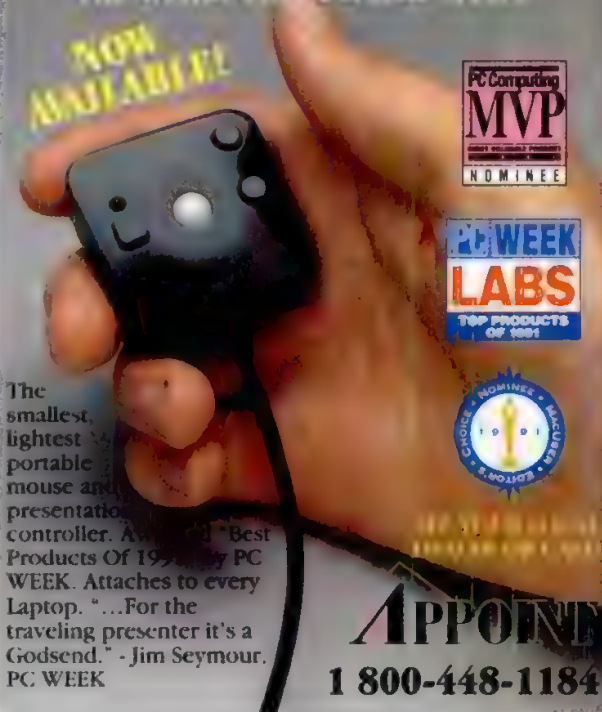
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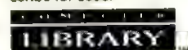
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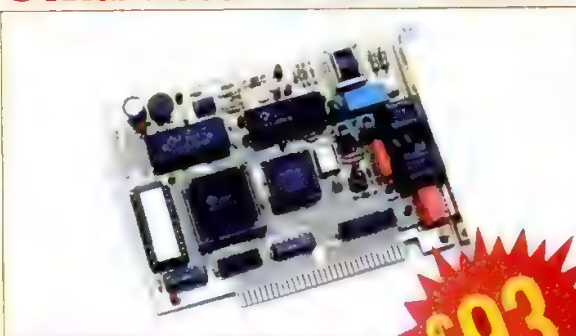
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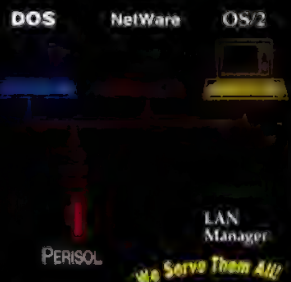
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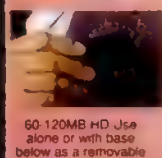
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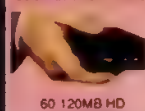
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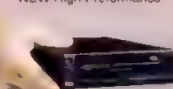
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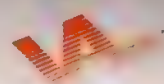
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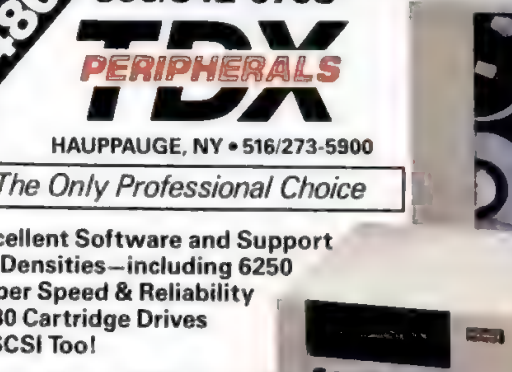
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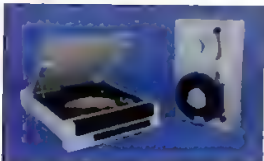
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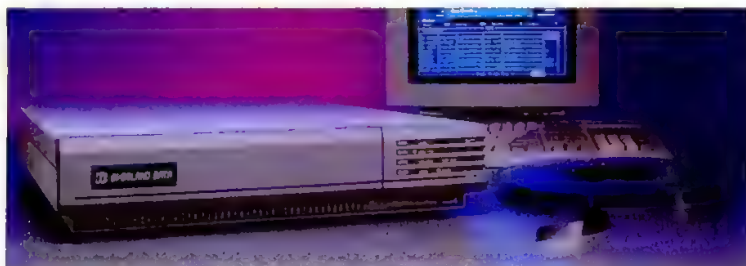
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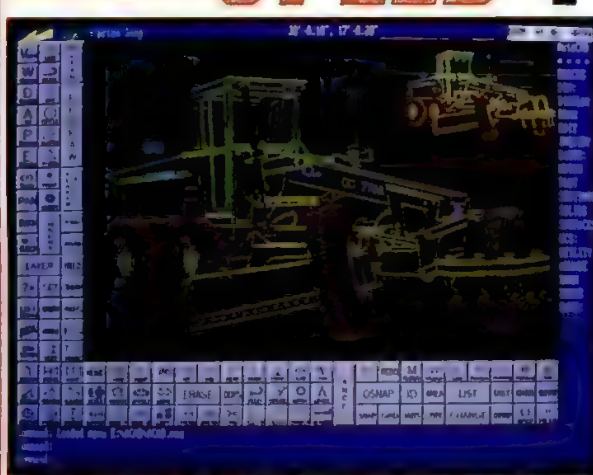
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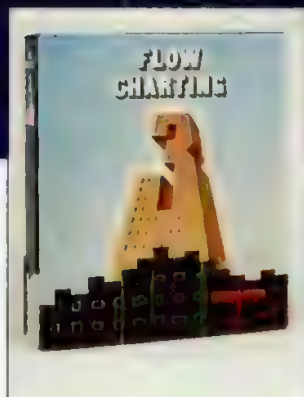
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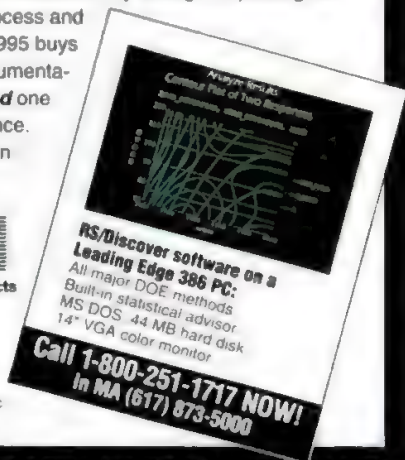
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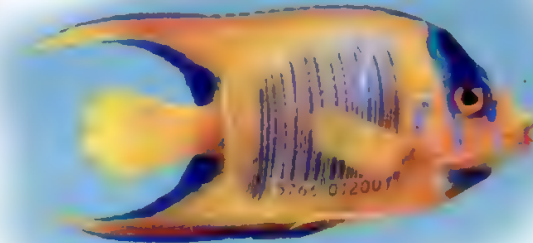
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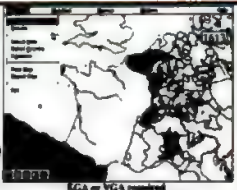
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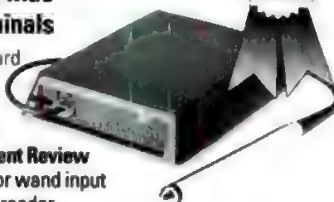


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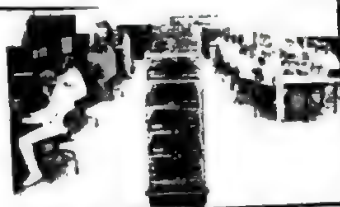
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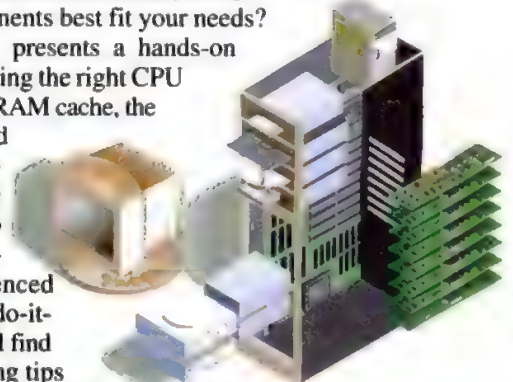


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PC Magazine presents a hands-on guide to choosing the right CPU and processor RAM cache, the best storage and disk caching options, and the hottest video cards and monitors. Experienced buyers and do-it-yourselfers will find practical buying tips and strategies for building the perfect server, Windows workstation, or light-duty desktop machine.



■ TCP/IP

The Transmission Control Protocol and Internet Protocol (TCP/IP) was the first widely accepted standard for interconnecting Unix hosts. Now, TCP/IP isn't just for Unix anymore. *PC Magazine* Labs looks at DOS packages that run on the Open Data-link Interface (ODI) and maintain concurrent sessions with both Unix hosts and Novell file servers.

■ OCR SOFTWARE

Retyping a printed document for use in your word processor can be an annoying, tedious task. Optical character recognition (OCR) software might be the solution. We test nine packages to see how well and how easily they convert printed documents to electronic text.

■ THE PERFECTLY OPTIMIZED PC

Crafting a well-tuned PC is a mixture of art and science. Next issue, we focus on optimizing your PC's use of memory. An in-depth look at DOS 5.0, *Netroom*, *QEMM-386*, and *386MAX* prove that tweaks and twists to your system configuration can yield substantial improvements. We'll present the guidelines to give you the memory gain without the pain.

■ C/C++ COMPILERS

When we last looked at C compilers, few programmers were actually using C, but everyone was interested. Now C has become the language of choice for a majority of programmers, and C++ is emerging as the language of the future. *PC Magazine* will look at C compilers, with particular focus on the C++ compilers currently available.

■ UTILITIES

Installing Windows applications is easy, but uninstalling them can be a headache. Next issue's free utility, *INCTRL*, monitors every step an application's install program takes and writes a report file detailing activity such as added and deleted files and directories, changed files, new sections in WIN.INI and SYSTEM.INI, and new or changed keys in WIN.INI and SYSTEM.INI. With this written report, you can easily undo the changes made by any install program.

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After Hours

Products for the Leisure Side of Personal Computing

Pick a Good Flick: Software Movie Databases Let You Find the Right Film



When *Terminator II*, *Silence of the Lambs*, and *Pretty Woman* are all checked out of your video store, which one do you take home? If you're looking for something more entertaining than *Mutant Melons from Mars*, you can consult a computerized video directory. *PC Magazine* looks at four of the best in this roundup: *The Banner Blue Movie Guide*, Roger Ebert's *Movie Home Companion*, *VideoHound*, or the granddaddy of them all, *Variety's Video Directory*.

THE BANNER BLUE MOVIE GUIDE

The Banner Blue Movie Guide, by Banner Blue Software, is a boon for movie addicts. This program is a database contain-

ing 9,000 movies, and its considerable depth allows VCR junkies to wade through a maze of trashy movies to find the award-winning gems. Or maybe you want to find the trashy movies; they're here, too. And if you get bored with the movie you're watching, *Banner Blue* can also help you with that. There's an entertaining trivia game you can use to test your knowledge of movies in several different categories.

TBBMG employs a well-designed interface that works nicely on modest systems. Commands are carried out by using either the keyboard or a mouse. While the interface isn't particularly consistent—some commands require the use of drop-down menus, while others use function keys—it is easy and self-explanatory. Few users will have to refer to the manual. Using files that total a little over

750K, *TBBMG* takes up comparatively little room on the typical crowded hard disk. As a matter of fact, it doesn't even require one; *TBBMG* will run adequately from a floppy disk, too.

The program's strength is that, like any well-organized database, it allows you to gain insight by looking at familiar data in new ways. You can quickly sort movies by name, theme, director, or rating (X, R, PG, G), as well as by the actors and actresses who appeared in them, the awards they won, or the box office success they achieved.

The program even has a custom search capability that allows you to combine these elements in a complex search. This is useful if you're trying to answer questions such as who starred in more Woody Allen movies, Diane Keaton or Mia Farrow? (It's Farrow 11, Keaton 5.) Finding this answer takes only a few seconds with *TBBMG*.

If you click on the mouse, the program lists the other 24 movies Mia Farrow played in. Scroll through this listing and you're bound to find other interesting titles. This is one enjoyable aspect of the program—skipping around from one film title to the next, triggering memories of movies seen long ago.

The best part about *TBBMG* is that it draws you in. Looking at any one movie gets you thinking about others like it, or actors in that movie, and you can sometimes end up jumping around in a hypertextual way.

■ MOVIES
Whether you want to find a film quickly or read a detailed synopsis by Roger Ebert, *PC Magazine* reviews software that's right for today's movie buffs.

■ GAMES
L'Espresso: How you can be in the center of the L'Espresso as you battle for control of Hollywood's crown.

You can also print out a list of movies to carry to the video store, or add your own comments to the database.

There are a few problems with *TBBMG*, however. The list of actors and actresses in any one movie is quite short—some times only two or three. As a result, it's hard to find movies in which well-known stars had bit parts. For instance, searching for Meryl Streep did not list her appearance in *Manhattan*, where she played Woody Allen's ex-wife.

Also, the movies that match a given search criterion are always shown alphabetically, with no other sorting option available. It would be useful to be able to show them arranged by date of release—for instance, if you wanted to print out a chronological list of movies in which Best Supporting Actresses appeared.

Another problem inherent in this kind of program is that it ages quickly. To solve this, *Banner Blue* has announced

CONTINUES



The Banner Blue Movie Guide features a character-based windowing environment and custom searching across its database of 9,000 films.

After Hours

Movies

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that it will release update disks, whose availability and price have not yet been determined.

These small concerns don't diminish the appeal of a terrific program. It's not the next killer application, but it's a lot of fun. It's the kind of program that would appeal to a wide range of computer users. Does this mean we'll now have to take our portable PCs to the video store?

MOVIE HOME COMPANION

Quanta Press's *Movie Home Companion* is a cumulative collection on CD-ROM of Roger Ebert's widely syndicated movie column. In addition to 1,330 full critiques, there are 90 interviews with well-known actors and actresses as well as 25 essays on topics such as colorization.

In each review, Ebert presents a thorough discussion of the story line, the characters, and why the film succeeds or fails. Often he includes side-lights about the actual filming or about other films. For example, he tells us that Thomas Harris, who wrote *Silence of the Lambs*, had a preceding novel about Hannibal Lecter (*Red Dragon*) that was made into the movie *Manhunter*.

Directory information for each film includes running time, year released, MPAA rating, and Ebert's own evaluation based on a four-star scale. The extensive credits include both the actors' names and the cast of characters—a feature missing in other products.

Even if you don't agree with the Chicago movie maven's opinion, you'll learn enough about the plot and subplots in a film to know whether you want to see it.

The bad news is that in order to access a *Companion* review, you must contend with retrieval software that borders on awful. On the plus side, everything is contained on the CD-ROM; there are no programs or files to copy to your hard disk. On the negative side, this is the most

verbose and least intuitive software we've ever encountered. For example, you must wade through three menu screens to pull up a review by its title. In some places you use the Enter key and in others you press the Spacebar to continue.

Selecting various combinations of menu options allows you to search the database by title, credits, MPAA rating, and Ebert's rating. There are, however, no cross-links like those in *TBBMG* that let you instantly jump to related movies. In the *Silence of the Lambs* review, for example, you can't get to a review of the cited *Manhunter* by clicking on its name. In reality, this is a generic retrieval program not designed for and not particularly suited to *Movie Home Companion*. Perhaps it seems worse than it is in comparison with the exceptional Banner Blue interface.

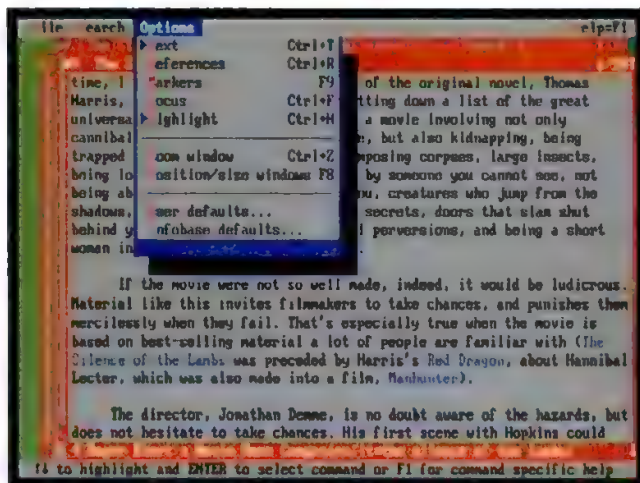
As Roger Ebert would say: Thumbs up on the reviews themselves, and a big thumbs down on the software.

VIDEO DIRECTORY

Variety's Video Directory, another CD-ROM product, is the ultimate source for information on videocassettes. While *Companion* covers 1,330 movies in depth and *TBBMG* gives a short description of 9,000 films, *Variety* embraces a whopping 75,000 videos—everything from Army training films to the latest Hollywood releases.

Most of *Variety's* descriptions fall between the one-liners of *TBBMG* and *Companion's* multiparagraphs, but some 2,500 films are reviewed in detail. Each film is indexed by title, leading players, director, genre, key words, year produced, awards, and—since this product is designed for video wholesalers and retailers—price, along with manufacturer/distributor.

Variety's completeness is illustrated by a search for *Manhunter*: Three films by that name were made in 1974, 1983, and 1986, respectively; the newest, whose description reads "a former FBI agent is called upon to track down a serial killer," is obviously the film to which Ebert refers in his review of *Silence of the Lambs*.



Roger Ebert's *Movie Home Companion* offers the most detailed reviews of any PC-based product, with 1,330 full reviews and 90 interviews with today's film stars.

Variety's point-and-shoot interface is straightforward and not likely to cause any grief for the average computer user. To pull up a review by title, for example, you pick search and enter the title. A browse menu lets you page through the directory by titles, performers, and other key criteria. Combining search terms can produce all sorts of exotic things, such as a list of pre-1950s westerns costing less than \$15. For commercial users the software offers an on-line order-entry feature.

Variety's one drawback is its price. At \$395 for a one-year subscription (which includes four updates annually), *Variety* falls beyond the means of the average movie buff. As a somewhat less expensive alternative, the Bureau of Electronic Publishing sells a single-issue version for \$189.

VIDEOHOUND

VideoHound is a product designed for retail video stores, although serious film buffs will appreciate its thoroughness. Unlike *Variety*, which is intended for store personnel, *VideoHound* was designed to be used by both staff and customers. Indeed Blockbuster, the world's largest video retailer, is evaluating a touch-screen version of *VideoHound* in a south Florida location with an eye toward putting it in all its stores; customers access the database from 11 kiosks in the store.

Hound's database contains

25,000 current videos and comes with a monthly service that adds both new releases and forthcoming videos. Select the New Release category from the menu and you'll find those videos released in the last few months and, in a separate section, forthcoming videos and their release dates. Using the PC's internal calendar, the software automatically moves "forthcomings" to "new releases" on the appropriate day. Should the video release date change (as often happens), the monthly update makes the correction.

VideoHound's interface is easy both to learn and to use. Menus are accessed either by point-and-shoot topics or by alphabetic keys. The retrieval system picks videos by title, actor, rating, category, awards, and half a dozen other factors and combinations of factors. There are more than 700 categories, some very specialized—such as "Alien Beings—Benign" and "Alien Beings—Vicious." Retrieval is especially fast because the entire 30MB database can be installed on your hard disk.

One particularly strong feature lets you participate in a viewer's review poll for any film; you can query the results, for example, by finding all videos given four stars by store customers. Another nice feature lets you vote on whether the store should acquire a particular

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After Hours

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video. On the downside, *VideoHound* displays only actors' names, not the characters they portray, as Ebert does.

WHAT TO BUY

The Banner Blue Movie Guide, *Movie Home Companion*, *Variety's Video Directory*, and *VideoHound* each have an important place in video software. *TBBMG* is far and away the best for general home use and truly a "must" for even casual film fans. It is very fast and the cross-indexing couldn't be better; it is the only one of the four programs that doesn't require a CD-ROM drive or huge amounts of disk space. *TBBMG* identifies both theatrical releases and those on cassette.

Movie Home Companion is the place to find in-depth reviews and the finer points of film watching. Ebert is a master at calling attention to things that are easily missed in a film. While *Companion* obviously covers films available on cassettes, there is nothing to help the user identify those in video release. The credits include the cast of characters, but the retrieval software is frustrating.

Variety's Video Directory is the comprehensive guide to what's available in which format (beta, VHS, and laser disk); it covers no theatrical releases. *Variety* has twice as many reviews as *Companion*, but they lack Ebert's insight. *Variety's* retrieval software is smooth and intuitive. If you are a serious film buff, buy a copy. *VideoHound* is a video customer's dream; let's hope our local

DIAL M FOR MURDER MOVIES: A Guide to On-line Reviews

You don't have to buy a theater to enjoy popcorn, and you don't have to buy one of these programs to get movie reviews. Much of the information in these databases is available on-line through information services like Prodigy, CompuServe, and Dow Jones News/Retrieval. These on-line services also have another advantage: They are updated frequently.

Prodigy offers Magill's *Survey of Cinema* with more

than 13,000 reviews; the database is updated every two weeks. In addition, Prodigy has another service called the Reel Poll, which lets subscribers rate current theatrical releases for a real grassroots perspective.

CompuServe features Roger Ebert's *Movie Home Companion* running on-line with a menu that makes searches a snap. You can even correspond with the syndicated columnist and movie critic,

who tries to answer all his electronic mail. CompuServe also has the Magill *Survey of Cinema*.

Dow Jones News/Retrieval gets its video data updated weekly from *Cineman Movie Reviews*. In addition to two- and three-paragraph film descriptions, it has separate menus for upcoming, new, and current releases. However, *Cineman* is also the most terse of the on-line services. —DT

video stores install it soon, since 30MB is more than most users can devote to one software package. The user interface is almost as good as *TBBMG's*, and the number of movies in its database is two-and-a-half times larger.

List Price: *The Banner Blue Movie Guide*, \$44.99.

Requires: 512K RAM, DOS 2.0 or later. Banner Blue Software, P.O. Box 7865, Fremont, CA 94537; 510-794-6850.

CIRCLE 462 ON READER SERVICE CARD

List Price: Roger Ebert's *Movie Home Companion*, \$79.95.

Requires: 640K RAM, CD-ROM drive, Microsoft Windows with Multimedia Extensions. Quanta Press, 1313 Fifth St. SE, #208C, Minneapolis, MN 55414; 612-379-3956.

CIRCLE 463 ON READER SERVICE CARD

List Price: *Variety's Video Directory*, \$189 (for single-issue version).

Requires: 640K RAM, CD-

ROM drive, Microsoft Windows with Multimedia Extensions. Bureau of Electronic Publishing, 141 New Rd., Parsippany, NJ 07054; 800-828-4766.

CIRCLE 464 ON READER SERVICE CARD

List Price: *VideoHound*, \$399 (network versions available).

Requires: 640K memory, 30MB hard disk space. Promark Ltd., 6207 Pan American Frwy. NE, Albuquerque, NM 87109; 800-321-9916.

CIRCLE 466 ON READER SERVICE CARD

Koei's L'Empereur Simulation Relives Napoleon's War of Revolution

GAMES
by Fredric Burke

Historical hindsight gives everybody a chance to be a general. For \$59.95, Koei Corp.'s terrific *L'Empereur* gives you control over every aspect of Napoleonic France, from assigning governments in conquered territories to planning cam-

paigns against those countries banded together against you. Will you be able to rebuild a France torn apart by years of revolution and then prevail at the gates of Moscow?

L'Empereur follows Napoleon's rise from his humble beginnings as a young artillery officer to his ascendancy to the throne of France. The game's goal is to unify Europe's 46 major cities under the French flag and rule the continent.

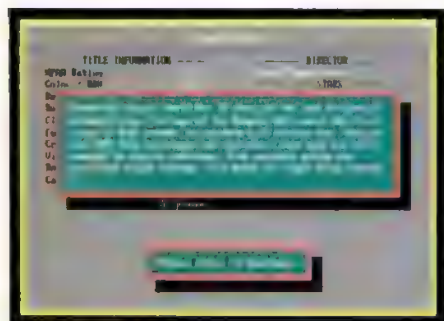
L'Empereur is broken down into four scenarios. While it is possible to jump into any scenario at any time, they should be completed in sequence to get the full effect of the game. That makes for a long game—I once sat through a nearly 3-hour session before calling it a day—but *L'Empereur's* detail and the

complexity of play make the time spent on this simulation worthwhile.

The first of the four scenarios marks Napoleon's first victories in northern Italy; the second starts as he is named commander in chief of the French Army. The third scenario sees Napoleon taking control of the French government in Paris, and in the fourth he is named *L'Empereur Napoleon I*. Each scenario has its own set of conditions that must be satisfied before you can move to the next level. Those who are tired of shoot-'em-up games will revel in the planning to raise an army before going to battle.

Be prepared for long game turns. Taxes, agriculture, and raising and training an army all

CONTINUES



While its synopses are not as detailed as Ebert's, *VideoHound* offers information on 25,000 movies—provided you have 30MB of free disk space.

After Hours

L'Empereur

CONTINUED

take time. The game's time line is broken up into segments corresponding to the four scenarios, and each of those scenarios has its own peculiar needs and responsibilities. While you can assign governors to each conquered territory, major cities have their own set of requirements. For example, you can assign to Brest the job of building your fleet, make Reims your armory, keep the peasants and city-dwellers happy, and you will successfully unify Europe.

YOUR OWN PRIVATE WATERLOO

Defeat is something you'll surely taste. While being killed or captured ends your game immediately, you quickly learn when to recognize impending

defeat and leave the battlefield. It took me some time to make my way through the multitude of options available at each turn, but after spending a while with the very good manual (and making a couple of quick phone calls to Koei) my army was rampaging across Europe, although my fleet was somewhat less successful.

L'Empereur's graphics and sound, particularly now that it has built-in support for an Ad Lib card, are top-notch. *L'Empereur* is also among Koei's first simulations with mouse support built into game play; while the mouse does speed play more, switching between it and the keyboard can be tiresome.

L'Empereur is built around a very complete historical base, so the traits of individual commanders—both good and bad—are constants that you must contend with. Anyone who has ever played a Koei game will quickly feel at home in *L'Empereur*, but *L'Empereur*



As ruler of *L'Empereur's* France, envoys and allies will come to you for advice and counsel in governing the cities and provinces you've conquered.

demands that you pay attention. Its detail and complexity are great fun, provided you can plan ahead and foresee the actions of others. Koei's *L'Empereur* is not for everyone, but armchair generals will love it on a rainy Sunday afternoon.

List Price: *L'Empereur*, \$59.95.
Requires: 640K RAM, DOS 2.1 or later; mouse and Ad Lib or Sound Blaster card recommended. Koei Corp., One Bay Plaza, #540, 1350 Bayshore Hwy., Burlingame, CA 94010; 415-348-0500.

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Miriam Liskin, PC Magazine, and FoxPro 2.0. Three Pros, No Cons.



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Mea culpa: *Tempra GIF*, a high-end image editor, allows gradient fills, but it doesn't stop reviewers from misspelling the word. (*PC Magazine*, February 11, 1992)

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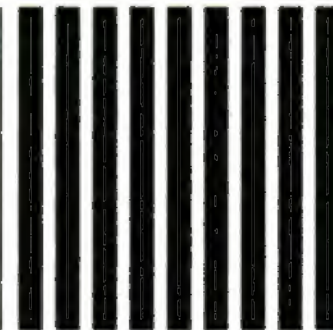
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